TEACHERS COLLEGE RECORD

VOL. VII MAY 1906 No. 3

THE CURRICULUM OF THE HORACE MANN HIGH SCHOOL

PART II

ART IN THE HORACE MANN HIGH SCHOOL

What should be the basis of art teaching in a high school? Should the aim be to give a certain number of hours of technical training in drawing, in the endeavor to cover the work of the first few months of an art school? This would result in very superficial work and would not touch the lives of the majority of our pupils.

A high school is composed of unsorted material. From our high schools, followed, perhaps, by a college course, the technical schools draw their constituents. Perhaps many of our students never go either to college or to technical schools—never get more than a high school education. Our course, then, is for general, not for special, training, and our graduates are to become the "general public," not a set of specialists. From among them a small percentage will become artists, and these, just as well as our future doctors and lawyers, must get their training in professional schools.

What relation, then, has the general public to art? I think we may sum up this relation in one word—appreciation. For example, we may not all become writers, but we all read books; and it is a matter of vast importance what books we read. Just so we shall not all become artists, but we all live surrounded by forms of art and of nature; and it is a matter of vast importance that we become alive to the subtle beauties of the one, and are able to discriminate between fine and commonplace examples of the other. Such a general cultivation of the powers

of appreciation will offer no handicap to those who intend to follow art as a profession. On the contrary, it lays the very broadest foundation for such future work.

Can the faculty of appreciation—the attribute of good taste—be cultivated? We believe it can by a study of the underlying principles of all space arts and by original effort. This is something different from correct drawing. We may have correct drawing and no art whatever. The method of study should be threefold. We need to trace these principles in the art of the past and to endeavor to appreciate their fineness. Each principle studied should be illustrated by as many examples as possible from the great art treasures of the world. This means ready access to fine collections of photographs, prints, textiles, and books of art. Then we should strive to create by use of the principles and, third, we should exercise our judgment in discriminating between better and poorer examples. We should stimulate our invention by making many variations of a given theme and by constant comparison and judgment train ourselves to select the best.

Subjects Studied.—What subjects shall we consider? In what does the general public most need training in good taste? You will say, first of all, objects of use in daily life—things that we buy and put into our houses or upon our persons. To accomplish this, work must be done, and of many kinds, for we cannot appreciate fully without some effort toward creating. For example, beautiful book-making—the spacing and arrangement of the letters composing the title, the further decoration of the cover, the composition of blocks of printing of the title-page, and the well-planned margins and arrangement of the text, as well as the varying expressions of different forms of type—will, I venture to say, be noticed and better appreciated all their lives by pupils who have had a little experience in planning and executing some such definite bit of printing and decoration.

And, second, you will say, pictorial composition. The students who have tried to use nature forms in the composition of a landscape, either in bare outline, in varying tones of gray, or in color, cannot fail to be more observant of the out-of-door world, more sensitive to its harmonies as seen both in nature and in art.

In connection with these we should study nature and also copy beautiful examples of our theme from the world's best art.

General Plan of Lessons.—Having chosen our subject, the general plan of lessons would be, first, the study of line and spacing. This is the foundation of all visual beauty. What makes the difference between the beauty of the Boston Public Library and the Flatiron Building in New York? Or the Flatiron Building and the Times Building at Forty-Second St.? Is it not one of proportion, of spacing, of line relations entirely? One may be as well built as the other; its right angles as accurate; its drawing faultless; but, if it lacks a fine relation of one part to another, it is ugly, or, at best, commonplace.

We next study dark and light—a broader term than light and shade—since it includes all dark and light relations, whether caused by sunlight and shadow or by local color—for example, a light hand against a dark coat. The architect makes use of dark and light when he plans broad cornices or varying depths of moldings or when he throws a colonnade with delicate perforations across the dark interior of a building—a scheme seen to perfection in many a Venetian palace! Just as much does he use this principle when he plans a pavement of dark marbles interspersed with pieces of light marble, as we see in Florentine pavements.

Next comes color with all its subtle harmonies or violent antipathies. Line, dark and light, color—each depends upon the one preceding. The dark and light cannot be good if the spacing be poor. The color will be a failure unless based upon good light and dark.

Has drawing from nature and from objects made by man no place in this scheme? Yes indeed, an important place, but a place that is secondary not primary. From the world of forms about us come most if not all, of the material used in our work. Studies of these form a natural part of our course. Only we do not make these studies an end but a means, nor confound the science of representation with the art of drawing. We believe, also, that the student's own desire to give adequate expression to his original ideas will stimulate his efforts to secure technical excellence in the drawing of his subject.

Application.—Our application of the study of the subjects

and methods outlined above would lead us to work out many abstract problems in three lines of work—line, light and dark, and color—in order that each principle may be isolated and so studied with singleness of mind. This cannot be done in the concrete example where other problems than the one in hand press for consideration. Following these come, naturally,

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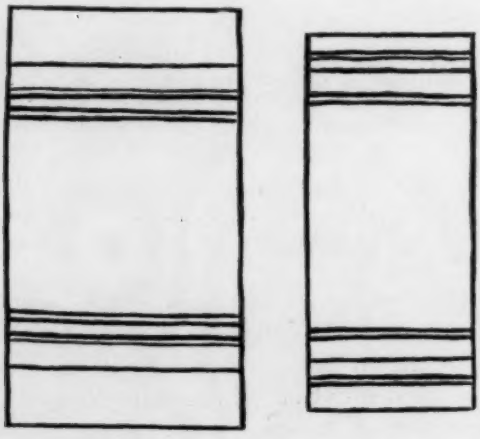
combinations which produce designs for objects of use on one hand and pictorial expression on the other.



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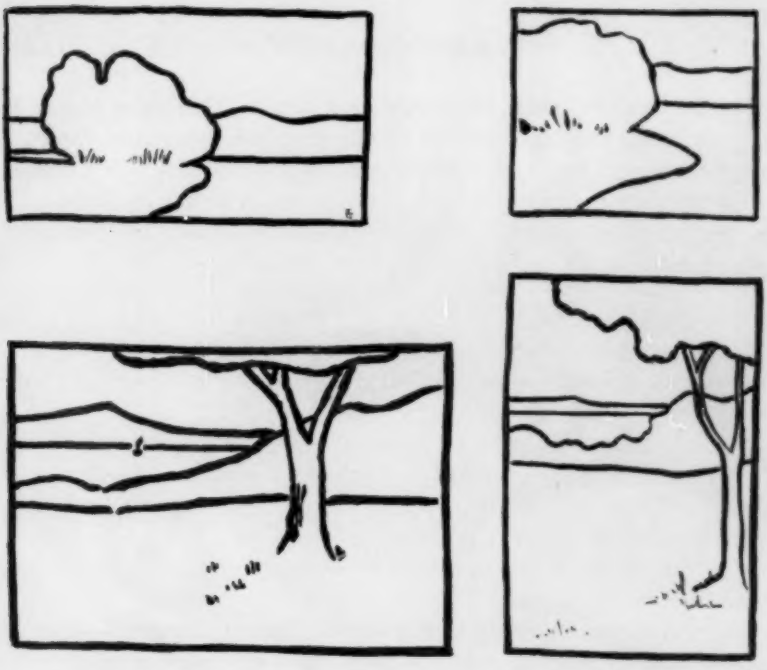
The whole aim of the course, it will be seen, is cultural rather than technical. It is the *spirit* rather than the *letter* emphasized, but neither ignored. The constant effort to give original expression, tempered by study of the thought of the past, must result in the best sort of character building.



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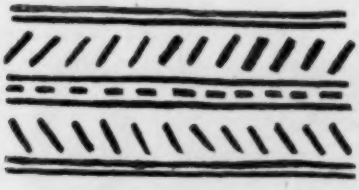

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Shall we be able to realize our aim? This must depend largely upon the time placed at our disposal, upon the careful grading of our pupils in order that a progressive series of lessons may be possible, and upon the position given to the department in the general management of the school and hence the amount of earnestness to be expected from the students.

L. A. T.

The illustrations shown are from pupils' work and indicate the course of study as carried out in the first year classes during 1904–1905.

The course for the upper classes is not given owing to the fact that they have not had the elementary work as a basis.

1. Effect of different spacings and groupings of straight lines. Molding.

2. A study in proportion and in spacing and grouping of lines. Rug.

3. An exercise in setting a subject having irregular shapes within a rectangle. Landscape reduced to its simplest lines.

4. Repetition, rhythm. Subject, straight-line borders.

5. Repetition. Borders applied to basket forms.

6. Nature study. Flowers in pencil outline.

7. Repetition in surface patterns. Grouping of long and short straight lines.

8. Flower composition. Steps:

(a) Spotting or composition of whole mass.

(b) Pencil studies from growing plant.

(c) Conversion of the spottings into flower forms from the studies.

(d) Addition of dark and light and color.

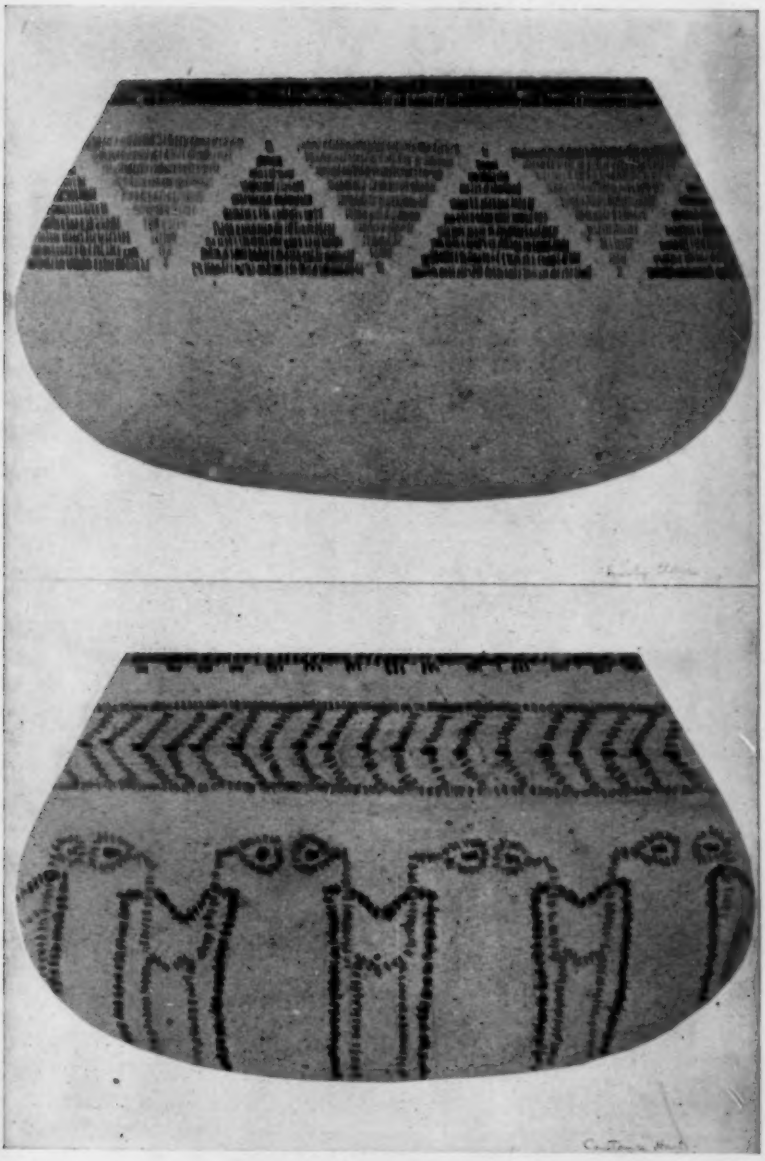
9. Nature study. Fruit in accented outline with cast shadow.

10. Same as No. 9 with color added.

11, 12, 13. Rug designs from symbolic motifs. The symbolism was derived from the personal experience of the children and invented by themselves.

14. Landscape composition. Light and dark and color.

L. A. N.



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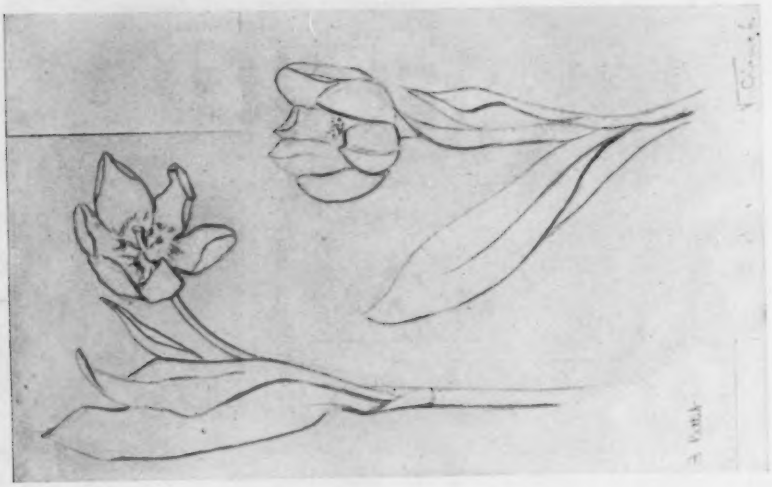

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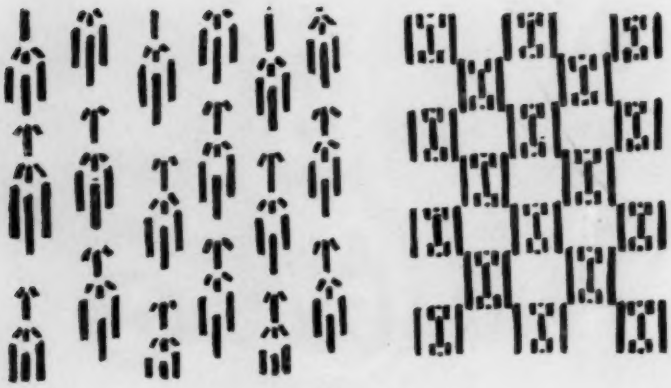

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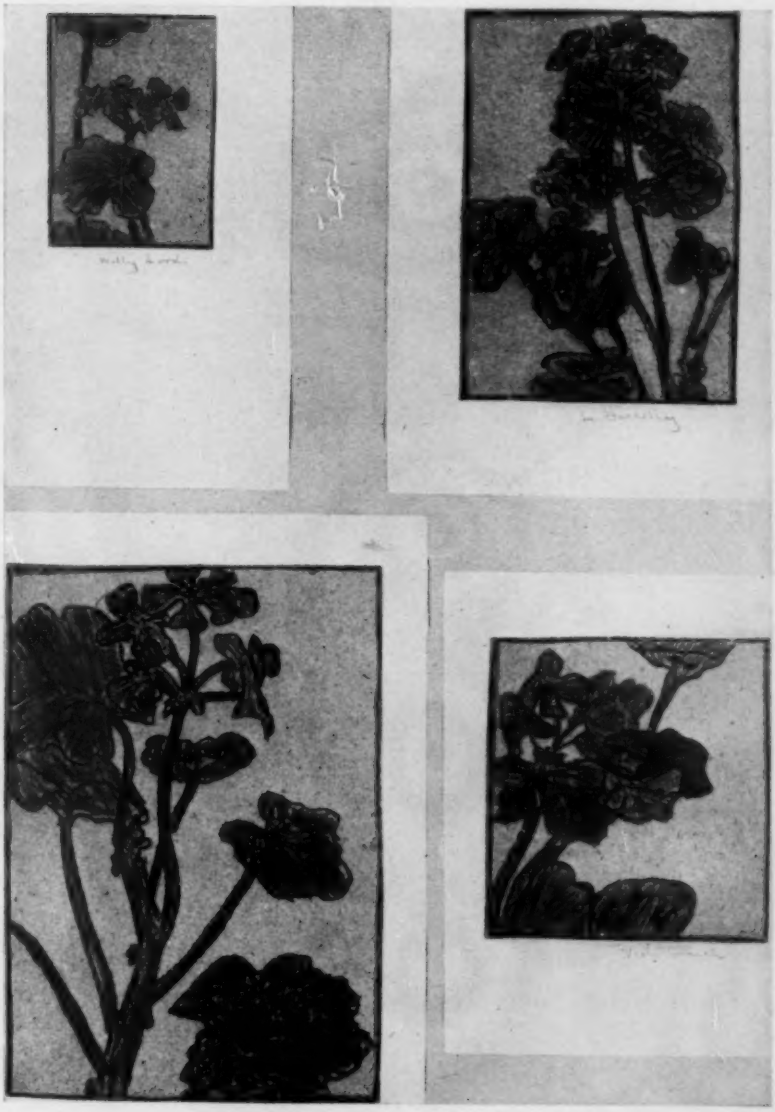

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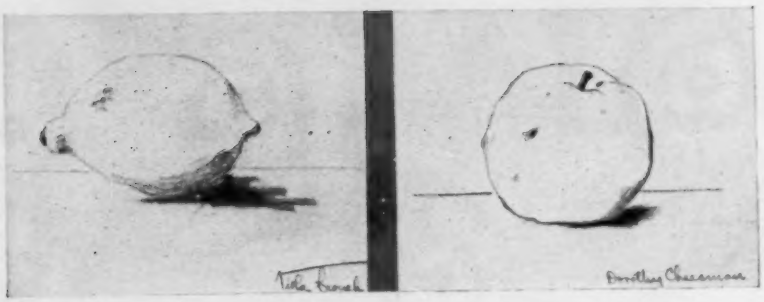

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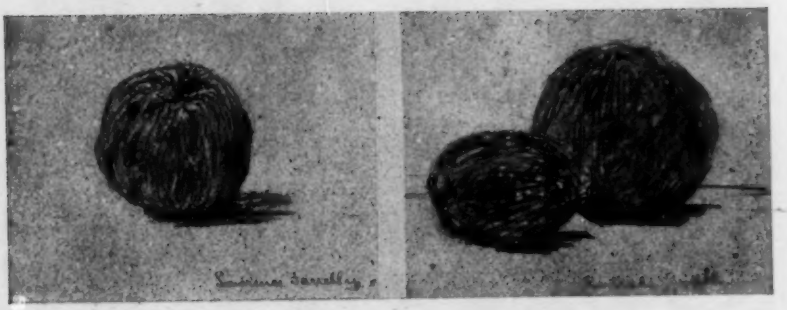

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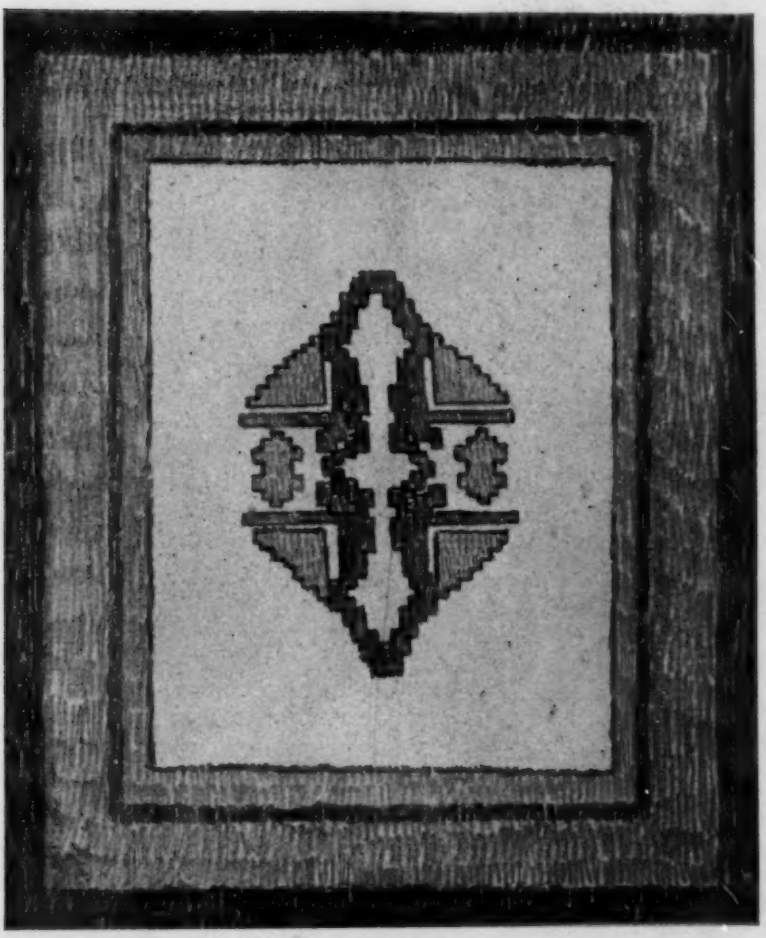

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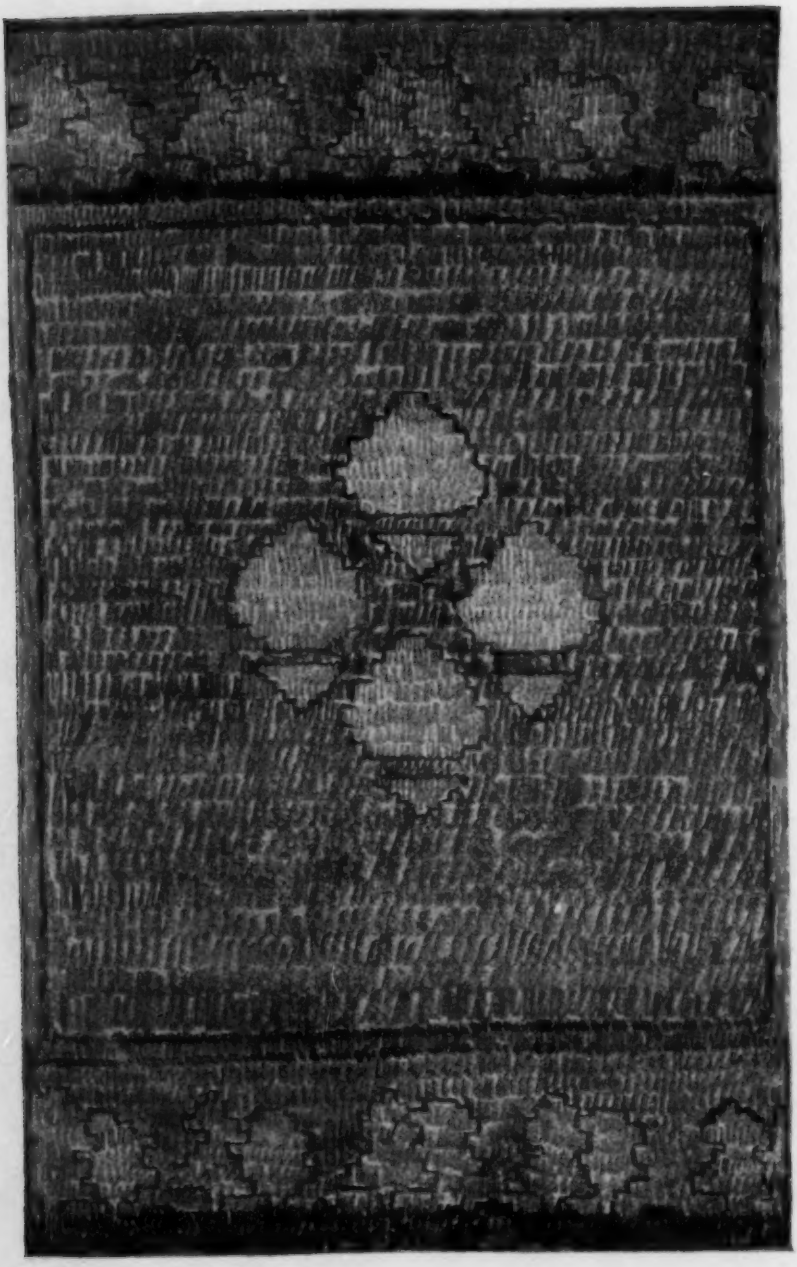

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DOMESTIC ART IN THE HORACE MANN HIGH SCHOOL

The aim of this course is to make it a vital part of a girl's education.

The work finds its suggestion in the home and thus becomes an important factor in correlating the school with the home life. Too much emphasis cannot be put on this side of the question. Women are the natural home makers, but in this day of so many outside interests girls are often led away from a proper conception of this side of their vocation. In a real home each must feel the importance of contributing his part, by doing or making something for it. What is the girl's part? How can she be led to have an understanding of it, that when she has a home of her own, she may be better fitted to take care of it?

The useful and often beautiful results of work done with the needle appeal to her. The average high school girl is familiar with those results but often entirely ignorant of the processes involved in bringing them about. She more often has little ability to solve the problems of every-day life with which she is sure to be confronted sooner or later. It is believed that by training girls to think and work systematically, and by demanding that the work shall be thought out before it is done, many of the failures which now so often discourage will be overcome. To accomplish this end, the work is made as practical as possible. In garment making patterns are used, for it is believed that knowing how to fit, adapt, and use patterns will be of greater value to these girls than drafting them.

The artistic as well as the useful side of sewing is emphasized: adaptability to purpose, fitness of structure, design and color, are dealt with. Each girl is led to consider what is best suited to her individuality. Then designs are made before the garment is begun, that each may have a definite idea to carry out. The study of textiles is taken up in connection with the work in order that the girls may know how to tell good from bad materials, their relative values, and how to buy them. It is aimed to give the pupils an appreciation of good work; to have them know when and why a thing is well done, and by doing it themselves to know the value of the work. The mere doing often

reveals possibilities before unthought of. The work itself becomes invested with new interests and a sympathy for the worker is felt that can be gained in no other way. Domestic Art is elective in the Second, Fourth and Fifth year High School.

OUTLINE OF COURSE.

II. HIGH SCHOOL

Time—80 minutes, twice a week.
Work elective and not a college requirement.

Subjects

I. Hand sewing.
Underwaist.
1. Cut and fitted from pattern.
2. Application of the following stitches:
Running; stitching; hemming; overhanding; button-holes.
3. Application of the following principles:
French seams; hems; bias facings; bands.

II. Machine sewing.
1. Care and use of machines.
2. White skirt.
Application of
French seams, tucking, ruffling, plackets, bands, yoke.

III. Millinery.
1. Adjusting and altering wire frame.
2. Covering wire frame with straw.
3. Trimming hat.
Bows, flowers, feathers.

Principles of form and color are dealt with. Each girl is taught to apply those principles to her individual case.

IV. Study of materials.
1. How to judge between good and bad.
Relative values.
2. How to purchase.
Suitability to purpose.
Amount and cost for each garment calculated.

IV. High School

I. Dressmaking.

(1.) Shirt-waist.

1. Design made in paper.
   Tucks planned.
2. Plain shirt-waist pattern fitted.
   Application of that pattern to all styles of shirt-waist.
3. Calculation of amount of material required.
4. Shirt-waist made.
   (a) Involves cutting; fitting; tucking; seams; making sleeves, cuffs, collar band, belt; finishing, including sleeves, buttons and button-holes, hooks and eyes, etc.
   (b) Stocks for shirt-waist made.

(2.) Unlined dress.

1. Dress designed.
2. Bought pattern adapted to design.
3. Dress made.
   (a) Skirt.
      Same principles involved as in white skirt—nicer adjustment required.
   (b) Waist.
      Same principles involved as in making shirt-waist.
   (c) Girdle or belt.

In the dressmaking, principles of line, form, and color are studied and applied to individual cases. The girls are taught how to fit each other.

III. Weaving.

(1) Material for sofa pillow woven on hand loom.
   Material made into cover for pillow.

IV. Study of materials.

(1) Cotton, wool, silk, linen.

It is believed that the work with the raw materials will awaken an interest in the production and consumption of these things. The field of the work will thus be broadened and more closely related to some of the social and economic questions of the day.

V. High School

Time—80 minutes, twice a week.

Work elective and not a college requirement.

Subjects

I. Embroidery.

(1.) Different stitches taught preparatory to putting them on graduation gowns.

French and eyelet-hole embroidery; shadow work; fagoting; insertion of lace by use of some of these stitches.

II. Graduation dress.

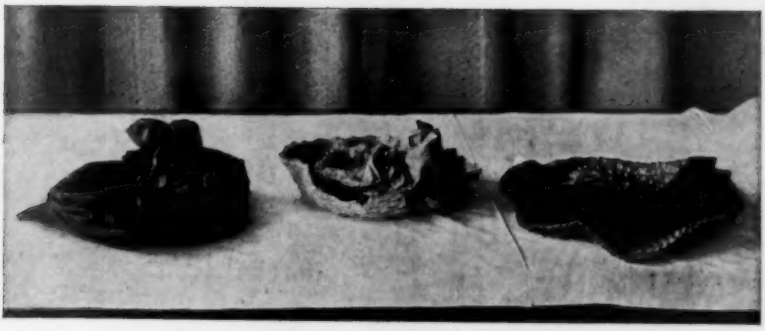
(1.) Application of one or more of these stitches in some simple design to gown.

(2.) In making the dress practically the same principles are involved as in making the unlined dress in the Fourth year.

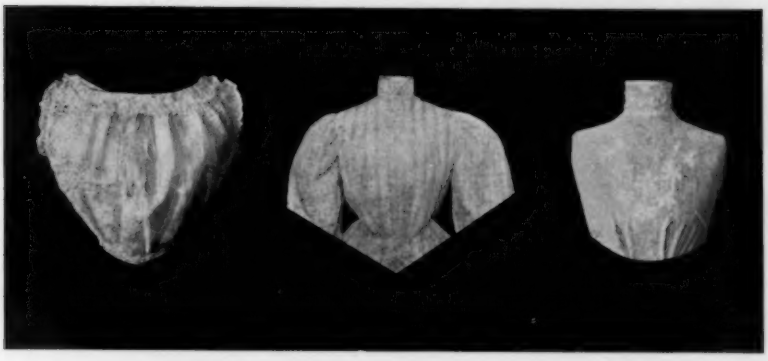
III. Stencilling.

Applied to chiffon scarfs, curtains, sofa pillows, etc.

K. S. A.



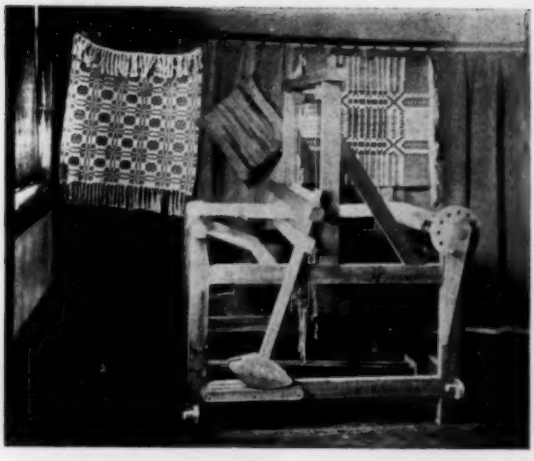
Hats made by II High School Girls



II years
High School

IV years
High School

V years
High School



Loom used in Domestic Art Room

DOMESTIC ECONOMY IN THE HORACE MANN HIGH SCHOOL

In reorganizing this line of work in the high school it was decided that domestic economy should alternate with domestic art through four years, the first and third being selected for the former because the younger girls need the greater physical activity that domestic economy gives.

First Year

In planning the course for the first year greater stress has been laid upon the economics than upon the scientific aspect of the subject for the reason that in that year it is impossible to correlate with any science courses that are given in the school with the exception of physiology. The economic aspect can be made interesting to girls of this age, and therefore the topics are selected with that end in view.

That part of the work which most immediately appeals to the average girl is the actual cooking. Girls between twelve and fourteen, of a well-to-do class, are less interested in learning to launder and clean a house than in the question of nutrition. That they will probably one day have homes of their own to direct, and should be trained for their business just as a boy is for his, does not appeal to them as a vital necessity as it is too far in the future. Thus the need of an immediate interest is felt. One method of creating such an interest is to make the culminating point of the year's work the giving of a meal to a group of teachers, and in making all the year's work hinge on this meal. Through this immediate interest they are led to appreciate the wider aspect of many of the problems connected with the home of to-day.

Since the pupils must plan, cook, and serve the meal, each girl is really hostess, waitress, and cook in one, and the pupils recognizing this will outline the course for themselves as follows:

Duties of a hostess—

Planning of meal with regard to kinds of food and digestibility.

Ordering supplies—quantities.

Marketing—selection and cost of food.

Decoration of table, sending of invitations, receiving of guests.
Keeping of household accounts.
Furnishing of dining-room.
Duties of waitress—
Care of dining-room.
Cleaning of metal, glass, and woodwork.
Sweeping and dusting.
Laundry work; waitress apron and shirt-waist; table linen.
Care of butler's pantry.
Systematic arrangement.
Care of sink and plumbing.
Setting table.
Waiting on table.
Duties of cook.
Cookery.
Serving and garnishing.

The general ideas developed through the discussions and practical work are as follows:

Household management: Definition of word "economy"—from the Greek—meaning house-law; definition of an economical housekeeper,—one who knows how to balance values and obtain the best results from materials, labor, and money; keeping of household accounts as an aid in obtaining these results; keeping of personal accounts as training for keeping household accounts.

Food supply: Definition of a meal; characteristics of different meals in different localities; balancing of food principles; selection of food with regard to digestibility and nutritive value; effect of heat as a factor in determining these; purchasing of food with regard to quality, price, and suitability to season.

Household work: Underlying ideas—health, comfort, beauty. illustrated in cleaning of room, laundry work, cleaning of metals; selection of cleansing agents with relation to saving of labor and saving of materials cleaned; systematic planning of housework to save labor and time; comfort and beauty in table setting and serving.

Household furnishing: Dining-room as a type—selection of furniture with relation to beauty and fitness; ease in caring for same; cost, quality, and lasting power of material.

The practical work consists of

Cooking: Effect of temperature and manipulation on proteid foods illustrated by eggs, oysters, fish, meat, poultry, and gelatine; on carbohydrates, by starches, sugars, vegetables, cereals, sauces, breads, and cake; on fats, by butter, cream, and olive oil. The making of constructive dishes illustrated by salads, desserts, made dishes, etc. Actual planning, preparation, and serving of luncheon.

Housework: Sweeping and dusting; cleaning of metals; cleaning of glass and woodwork; care of sink and plumbing. Laundry work: simple washing and ironing; starching; removing of stains and care of fine center-pieces and laces.

Table service: Table decoration; setting and waiting on table.

Well outlined note-books covering all work are required and account books in which a record of the pupils' allowances are kept.

Two two-period lessons a week are given to this work. One lesson consists of half discussion and half practical work in cleaning, etc., the other is given almost wholly to practical work. The relation of discussion and practical work is one to three or four.

Third Year

The course for the third year is planned for students who may or may not have taken domestic economy in the first year. The work therefore must include a foundation knowledge of food principles and at the same time may contain more advanced work in science and economics for which students of that age are ready.

Two double-period lessons per week are given, the first to consist of discussion and laboratory work in science (chemistry, physics, and physiology), home sanitation, and nursing; and the second to consist of practical work in cooking, illustrating, as far as possible, the principles taken up in the previous lessons.

The ideas developed through discussions and practical work are as follows:

Household economics; problems connected with modern living; detection of adulterations in common foods, necessity for pure food-laws; comparative cost of home-made products with high class purchased products and with cheaper purchased products; systematic housekeeping; domestic service and accounts.

Food supply: Composition of common foods and effect of heat on these; digestion and its application to preparation of food for invalids; effect of fermentation in bread making and prevention of same in preserving of fruit; interchangeability of foods in making up a dietary; balance of food principles.

The dwelling: Selection of site; plan and construction of house; arrangement and furnishing of rooms, water supply, and removal of waste; municipal provisions for same; ventilation and heating arrangements.

Emergency work: Qualifications of nurse; treatment of patient in case of burns, wounds, poisons, drowning, etc.; arrangement and care of sick room.

The practical work consists of

Food supply: Effect of heat on food principles (simple dishes, review work); application of principles learned here to more advanced work. Testing for adulteration of prepared foods bought in open market, tests on proteids, starches, fats; and oils, milk, etc.; experiments in fermentation.

The dwelling: Actual work in planning of a house; excursions to inspect buildings, heating, and ventilating plants.

Emergency work: Practical work in bed making; care of patient; bandaging, etc.

Note-books and account books are kept.

L. B. W.

MANUAL TRAINING IN THE HORACE MANN HIGH SCHOOL

In the manual training work of the high school, it is the purpose to give such an insight into modern industrial processes as is possible within the limitations of school time. With this object in view, the methods pursued are as near as possible identical with those of the best practice, and the projects selected represent in all cases typical and important constructions from the technical standpoint.

In order to present this technical knowledge in a form that will most appeal to the active interests of the pupils, the things made are always articles of direct use and service, such as simple furniture in the wood-room; bowls and boxes in the sheet metal shop; and candlesticks, lamp-stands, andirons, and fire tools in the forge shop.

To develop a wider knowledge of mechanical processes and some idea of the larger operations of commercial work, a number of visits are each year made to prominent industrial establishments in New York City and the vicinity. The æsthetic possibilities involved in the shop constructions are given careful consideration by setting aside a period each week during the first three years in which the design of the various projects is studied. As a result many fundamental æsthetic principles are developed and each pupil brings, to the shop a number of times every year, individual designs which he then puts into execution.

The first year gives but two periods a week to shop work in wood and one to design and attempts only simple models, such as pen trays, coat hangers, small boxes, mallets, etc. These models involve the use of a number of fundamental tools and serve to develop some degree of skill in their use. Besides these individual models a study is made, in the latter part of the year, of the subject of printing. Designs elaborated in the drawing room are etched on zinc plates and then printed by hand. Later on practice is gained at setting type on a hand press, and programs, bulletins, and other material incidental to school interests are printed.

In the second year more time is given to shop work, and

the study of bench work in wood is made more intensive. Such projects as wall shelves, book racks, picture frames, camp-stools, small tables, and step ladders are taken up. During this year considerable attention is given to methods of staining and finishing the various kinds of woods employed. A typical example of the work in design is the case of the mitred picture frame. A picture is first selected by each pupil, the proportions of mat and frame are then studied, and finally a color scheme determined upon.

Wood-turning is introduced in the third year as well as work in forming sheet metal into bowls, trays, and boxes by hammering and beating. After preliminary exercises in straight and curved turning, such pieces as a chisel handle, stocking darner, candlestick, napkin ring, towel ring, round box and cover, and dumb bells are attacked. This work is followed by cabinet work of a more advanced kind than that hitherto attempted, in which hardwood is mainly employed. Among the pieces that have been built are boot-blacking stands, tool chests, wall cabinets, and book cases. Parallel with this work in wood runs a course in beaten metal work. Copper is the metal used, and trays and bowls are hammered and formed from the flat sheet. Covers are fitted to boxes, and pieces, such as inkstands and candlesticks, are brazed and riveted together. The two lines of work are often brought together by making hinges and lock plates for the cabinets, and handles for the boxes and chests built in the wood shop.

At various times during the year illustrated talks are given upon the structure and properties of wood, the distribution of forests in the United States, processes of lumbering, and the main uses to which different kinds of common woods are put. Besides this a study is made of the principles of wood construction involved in such structures as furniture and buildings. The process of copper manufacture, the method of rolling plates, and the commercial methods of stamping and pressing sheet metal into shapes are also gone into in detail.

In the fourth year forging is the branch studied. After various simple exercises involving drawing out, bending, forming, upsetting, and welding, projects such as andirons and fire tools, candlesticks and lamp-stands, knockers and brackets are executed. At the end of the year a few steel tools are made

and then hardened and tempered. As the work progresses, the properties of wrought iron, soft and tool steel are compared, their fractures examined, and the different methods of working studied. The processes of production of these metals are explained and an endeavor made to bring out the economic elements represented in each. The chief uses to which each kind of metal is best adapted and the relative market prices are also pointed out.

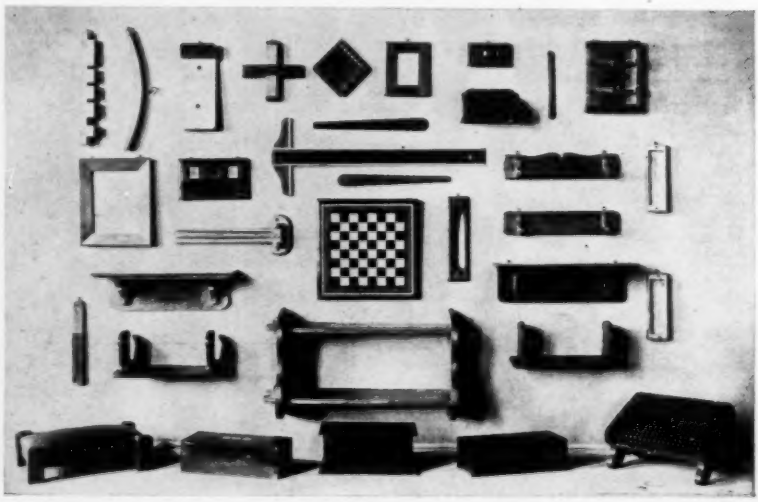
Part of this year is spent in molding and casting. Simple patterns are molded and cast in lead, and then a few examples of decorative work are cast in bronze. The modern and ancient processes of statuary casting are explained by illustrative models, and visits are made to ornamental bronze establishments.

Machine work is the subject of the fourth year. After some practice in filing cast and wrought iron, work at the machine tools is entered upon. Here each boy during the year makes a circuit of the various typical tools with which the shop is equipped, taking up a series of fundamental operations on each. A study is made of the mechanism of the various tools and the calculations necessary for their operation are carried through by each pupil.

While in the machine shop each boy takes his turn at operating a three-H.-P. vertical steam engine. He also sets the steam valves and runs the engine under varying conditions of cut-off and load, so gaining some idea of the action of steam in the cylinder and the relation of this to the power and efficiency of the engine.

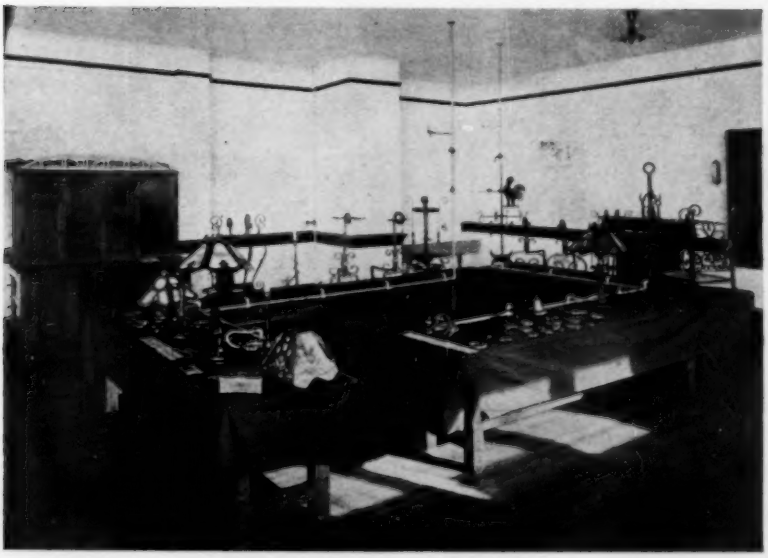
C. R. R.

Wood-Turning
Horace Mann High School

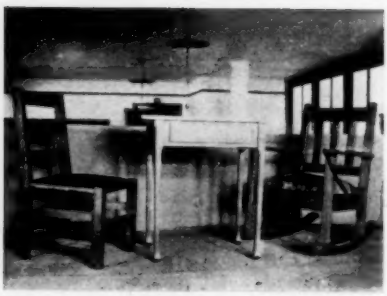


Woodwork
7th and 8th Grades and First year High School

Wood and Metal Work,
Second Year Class, Horace Mann High School



Sheet Metal Work, Forging and Casting
Second and Third Year Classes
Horace Mann High School.



Made by Third Year Class in Horace Mann High School

Oak Table
Built by Second Year Class in Horace Mann High School

Tool House for Garden Implements built by Second Year Class in Horace Mann High School.

MUSIC IN THE HORACE MANN HIGH SCHOOL

Before considering the music work done in the Horace Mann High School, attention should be drawn to the outside influences which have much to do in the cultivation of the musical taste. There are, first, the innumerable concerts and recitals, such, for instance, as the Young People's Symphony Concerts, conducted by Mr. Damrosch, to which explanatory remarks give an educational value. Then there is a very long and varied opera season. Of all this musical opportunity Horace Mann students take considerable advantage. It need hardly be mentioned that a large proportion of the pupils are taking private lessons, most of them on the piano, but some on the violin. For the more musical students there are the three organizations of the school, the Girls' Glee Club, the Boys' Glee Club, and the School Orchestra. Besides the singing of hymns and songs at the opening exercise, interesting piano selections are played, and an occasional recital of twenty or twenty-five minutes gives a chance for developing school spirit as well as musical taste.

The required work of the school consists of, first, one hour a week of song singing by the whole school. The work is conducted as any ordinary chorus rehearsal would be, the aim being the effective rendering of pieces. Second, the first two years in the high school have a period of forty minutes, when not only are songs practised but attention is paid to music reading, dictation and ear-training exercises, and details of notation.

Besides this required work, an elective course under the title of "Musical Form for the Listener" is open to students of the last two years. It consists of a weekly illustrated lesson giving practice in observation of musical form. During the first two months of the course, form in general is considered. Ordinary buildings are compared with public buildings and cathedrals; figures used in the industries with subjects from Greek sculpture; ordinary pictures with masterpieces of the great painters. Poetic expression is compared with prose statement of the same sort, and unrelated sounds, both artificial and natural, with the regulated sounds of music.

From such an extended comparison of the practical with

the artistic, the students learn that in the artistic use of form repetition very largely enters, and that where this cannot be used with entire freedom, as in sculpture, painting, and to some extent in poetry, omission of unrelated and discordant elements serves a purpose similar to repetition. They discover that the purpose of all this repetition and arrangement is to give to the art work a relationship of parts producing an organic unity of the whole. Still further illustrations are given of the way in which repetition is employed to give unity to the decorative elements in objects of ordinary use, such as rugs, wall paper, book-covers, markings on furniture and clothing.

When the how and what to observe in connection with artistic forms in general is well established, the same method is applied to music. The pupils learn to listen intently to the first few phrases of a musical composition, knowing that the nature of the piece can be judged only as they are able to retain in memory this key or text to the whole work. They learn how to trace the development of this opening subject into either a fugue or a sonata movement. After the principal instrumental forms have been illustrated and ability has been attained to name the form of a composition after listening to it once, those forms where poetry and music are united are taken up. The effect of both music and poetry on the various vocal forms is studied, the work being carried as far as such a combination of instrumental or vocal ideas as is illustrated in Wagner's *Rhinegold*. From this the transition is made to pure program music in its modern treatment, where a poetic text or a title at the beginning serves to give unity to the composition that follows.

There is considerable difference between a study of this kind and the work given in music text-books. In the latter the aim is to be able to construct the forms, and therefore a great deal of technical matter of practical value only to the composer has to be considered. The course in form outlined above has for its aim the perception of form itself. The question of how it is made does not arise. The emphasis in this work is given to the intelligent application of memory and concentration to what is heard, and to practice in the association of the various styles of musical repetition with their appropriate names. The result of the work is a decided increase in interest and intelligence in listening to music.

C. H. F.

PHYSICAL SCIENCE IN THE HORACE MANN HIGH SCHOOL [1]

Introduction

The work in Physical Science is scheduled for the third and fourth years of the high school course but as the work is elective the classes are apt to contain pupils from the other years as well. Some are preparing for college, many are not. The course in both chemistry and physics must therefore be adapted to the varying abilities of pupils ranging from fifteen to eighteen or nineteen years of age, as well as to the vastly different needs of these pupils. It is obvious that a course which is based solely on the college entrance requirements will not meet the needs of all. It seems possible, however, to plan a course in chemistry which will be adapted to the needs of students who do not intend entering college and which will, at the same time cover the entrance requirements.

In physics this does not seem to be so practicable for we believe that it is desirable that all students pursue a course covering the general principles of elementary physics and their application to every-day life before taking up the quantitative experiments prescribed for college entrance. To accomplish this we have a course running through one year to be taken by all those who elect the subject; and for those who are preparing for college, a review class where the general principles and certain quantitative experiments already performed are reviewed and additional quantitative experiments are performed. Students who are not planning to enter college may take this work if they so desire if they have taken the previous course.

It will be seen from the above that in the teaching of physical science our chief end is not to cover the college entrance requirements. The end we have in view was expressed by one of the pupils on completing the course. "The world does not seem quite the same place to you after you have studied chemistry and physics. Your eyes are opened and you see differently."

[1] For a further treatment of these subjects and illustrations of the apparatus used in teaching them, see the article on "Chemistry and Physics in the Horace Mann High School" by John F. Woodhull in the Teachers College Record for March, 1902.

If the study of physical science does this it does enough for the majority. If it does this it lays the foundation for the student who may choose to pursue it farther; it cannot but increase the efficiency of the boy who is going into business as well as add to his pleasure in living, and it must be of great value to the girl who enters the home or society. We cannot hope perhaps to make all our students love the subjects, but we have failed if we have not led them to respect them. The study of physical science has failed if it has not made for perseverance, for clearness of thought, and intellectual honesty. With these ends in view it would seem that physical science makes its own appeal for a place in the curriculum of every boy and girl.

Our equipment for teaching the subjects includes: (1) a lecture room with cases containing apparatus and chemicals for demonstration; a lecture table equipped with electrical connections from the dynamo and lesser batteries, also a stereopticon; (2) a chemical laboratory furnished with tables containing drawer and cupboard room for at least forty-eight students, large specimen and chemical cases, and ample hoods; (3) a stock room situated between the chemical and physical laboratory with a window from each opening into it; (4) a physical laboratory furnished with tables arranged in two "horse shoes" so that the teacher may pass between them; a side shelf running half way round the room furnished with gas and electrical connections; cases for apparatus and shelves for reference books; (5) a tool-room where apparatus may be made or repaired by pupils or teacher; (6) a dark room; (7) private laboratories and preparation rooms.

Physics

GENERAL COURSE. THIRD YEAR

The course runs through the school year (thirty-three weeks) for five periods (forty minutes each) a week. The five periods are divided into (a) lecture (one period), (b) laboratory (three periods) (c) quiz (one period). This proportional assignment is varied from time to time as occasion requires. It is often necessary to devote more time to laboratory work, and on the other hand laboratory periods are sometimes used for both oral and written quiz work.

REVIEW COURSE IN PHYSICS

The review class in physics is assigned to the fourth year of

the high school. It meets one day (2 hours) a week throughout the year. The time is devoted largely to laboratory work. The recitation periods are devoted to a review of general principles and the study of typical examination papers.

Chemistry

SCHEDULED FOR FOURTH YEAR

The course runs throughout the year (thirty-three weeks) and is assigned five periods (forty minutes each) per week. The five periods are divided into (a) lecture (one period), (b) laboratory (three periods), (c) quiz (one period), but this division is not strictly adhered to.

TEXT-BOOKS

I. General Physics: Henderson and Woodhull's *Elements of Physics*.

II. Physics Review: Same as above supplemented by many reference books.

III. Chemistry: Remsen's *Elementary Chemistry* (briefer or advanced course).

LABORATORY NOTE-BOOKS

I. General Physics: Woodhull and Van Arsdale's *Physical Experiments*.

II. Physics Review: Students compile their own note-books by review of certain experiments from Woodhull and Van Arsdale's *Physical Experiments* and by addition of certain other experiments performed from mimeographed directions.

III. Chemistry: Woodhull and Van Arsdale's *Chemical Experiments*.

REFERENCE BOOKS

I. General Physics: The standard elementary text-books, also Watson, Ganot and Barker, Thompson's *Magnetism and Electricity* and Tyndall's *Heat a Mode of Motion*.

II. Physics Review: Same as above.

III. Chemistry: The standard elementary text-books, also Remsen's *Advanced Course*, Remsen's *Organic Chemistry*, and Newth's *Inorganic Chemistry*.

EXCURSIONS

Excursions about the building for the purpose of investigating the heating, ventilating, and electrical apparatus are an important feature of the work in physical science. Excursions are

also conducted from time to time to power-houses, ice plants, soap factories, soda water and mineral water works, gas factories, and other available city plants.

SYLLABI OF COURSES

A. General Physics.

I. Extension and Weight of Matter: Weight units—volume units—relation of metric to English units of weight and volume.

II. Properties of Matter: Solids—liquids and gases—cohesion and adhesion—gluing, welding, soldering—porosity—capillarity—appearance of water and mercury in small tubes—diffusion of liquids and gases—osmose—crystallization—crystallization of water, type metal, etc.—viscosity—elasticity—malleability—theory of molecular constitution of matter.

III. Mechanics of Solids: 1. Pendulum—relation of time of vibration to amplitude of vibration, weight of ball and length of pendulum—how length is related to time—laws of pendulum—problems on pendulum—finding height of ceiling by the swinging of a pendulum—adjustment of clocks—metronome. 2. Laws of Motion: Inertia—getting on and off moving cars—stable, indifferent, and unstable equilibrium—gravity. 3. Uniformly Accelerated Motion: How far will a body fall during any unit of time? How far will a body have fallen at the end of any unit of time? How long will it take a body to fall a given distance? What is the average velocity of a body during any given unit of time? What is the velocity of a body at the end of any unit of time? Path of projectiles. 4. Moments of Force and Machines: Work—problems on simple machines—conservation of energy—transformation of energy. 5. Momentum: Factors involved—units of momentum. 6. Questions and Problems: Why does a stream of water falling freely tend to separate into drops?—Why should one, in getting on or off a moving car face the front?—Upon what does the efficiency of a spring balance depend? How long will it take a ball thrown upward with a vertical velocity of 256 ft. per second to reach the ground?—How far will it travel?—Why are long handled shears used for cutting metal? etc.

IV. Mechanics of Fluids.

1. Pressure in Liquids: Principles of liquid pressure—pressure per square inch and per square centimeter—relative

weight of water and mercury—pressure represented by mercury and water columns—problems to find height of water in tank by height of mercury column it will support—buoyancy and specific gravity—Archimedes principle.

2. Pressure in Gases: Difference between pressure in liquids and gases—air has weight therefore it exerts pressure—weight in vacuum—fountain *in vacuo*—Magdeburg hemispheres—barometer; why it does not measure height of atmosphere—Boyle's law—corrections for temperature and pressure.

3. Pressure Transmitted: Hydrostatic press—work—conservation of energy—transformation of energy.

4. Miscellaneous Applications of Principles: Cartesian diver—siphon—Tantalus cup—siphon fountain—Sprengel's pump—lifting pump—force pump—Hero's fountain—student lamp—fountain sponge cup, etc.

5. Questions and Problems: A cubic foot of ice weighing 56¼ lbs. is floating in water, and $\frac{1}{11}$ of its volume rises above the surface. How may you compute from this the weight of a cubic foot of water?—Granite is about 2½ times as heavy as water. How much would you be obliged to lift while holding a cubic foot of it under water?—How much will a vessel weighing 50,000 lbs. need to be loaded in order that it shall displace 1000 cubic ft. of water?—A mercury pressure gauge attached to a water faucet registers 30 in. Compute the height of the water in the tank above the mercury in the gauge and the pressure it exerts in lbs. per sq. in. and in grams. per sq.cm.?—What would be the buoyant force at a height in the atmosphere where the barometer would register 7½ in. upon an object having a volume of 5 cu.ft.? etc.

V. Heat.

1. Produced by Friction, Pressure, and Chemical Action: Hot axles—fusing of rocks—manufacture of ice.

2. Effects of Heat: Expansion of solids, liquids, and gases—hot-air engines—steam engines—crystallization—maximum density—metal, liquid, and air thermometers—absolute zero—corrections for temperature and pressure—evaporation—distillation—dew point—relation of pressure to evaporation—boiling point on mountains—gelatine from bones—vacuum pans.

3. How Heat is Transferred: Good and poor conductors—

conductors of heat and electricity—kindling temperature—miners' safety lamp—double doors and windows—convection, ventilation—hot-water pipes in houses—winds—land and sea breezes—ocean currents—radiation—heat from sun and heat from open fires—hot houses.

4. Specific Heat: Unit of heat—How heat is measured—temperature and quantity of heat—how large bodies of water modify the climate—land and sea breezes.

4. Latent Heat: Heat disappears when solids liquefy and when liquids vaporize—heat reappears when vapors liquefy and when liquids solidify—ice machines—double boilers—liquid air—steam heating—temperature in center of a storm.

6. Questions and Problems: Why is heating the neck of a bottle sometimes an efficient method of freeing a ground-glass stopper?—The temperatures of boiling water in a locomotive boiler and on a high mountain differ. Why? Why can fish live all winter in the lakes of cold regions where the thermometer falls below zero?—If equal weights of water at 20° C. and mercury at 70° C. were poured together what would be the resulting temperature? Through how many degrees could 100 gms. of water be heated by the amount of heat it takes to melt 10 gms. of ice? How many heat units would it take to change into steam the water formed by the melting of the ice?

VI. Magnetism and Electricity.

1. Magnets: Natural and artificial magnets—induced magnetism—molecular theory of magnets—lines of force about magnets.

2. Static Electricity: Two kinds of electrification—electrification by contact and induction—conduction—electrical distribution—electrophorus—Leyden jar.

3. Electric Currents: Essentials of a battery cell—to detect the presence of an electric current and its direction—chemical effects of electric currents; ionization—electrolytic dissociation—storage batteries—heating effects; electric ovens—resistance—magnetic effects; the helix—telegraph sounder—electric bell—electric motor—galvanometers.

4. Electrical Measurements: Microcaliper—resistance—Ampere—volt—finding the length of a wire by its resistance—series and parallel arrangements of battery cells—motor—dynamo.

5. Induction: Study of telephone magnets—electric machine, coil, etc.

6. Radiation: Electrical rays; X-rays—wireless telegraphy.

7. Questions and Problems: Distinguish between a magnetic substance and a magnet.—Can you charge a pith-ball negatively by means of a glass rod? Explain.—Upon what does the quantity of current depend?—Discuss Ohm's law. What means are taken to prevent "polarization" in a battery cell?—A certain spool containing copper wire No.24 offers a resistance of 0.2 ohm. How much current would a battery cell with an internal resistance of 0.1 ohm. and an E. M. F. of 0.8 volt send through this spool? etc.

VII. Light.

1. Law of Inverse Squares: Photometry—Bunsen and Rumford photometer.

2. Visual Angle.

3. Light through Small Apertures: Images through keyholes—cameras.

4. Shadows: Umbra—penumbra—shadows cast by electric lights—shadows of earth and moon as cast by sun.

5. Reflection in Plane Mirrors: Angle of incidence and reflection—position of image of object in mirror—length and breadth of mirror necessary to see one's whole figure—result of varying one's distance from the mirror.

6. Reflection in Curved Mirrors: Images in concave mirrors when object is nearer the mirror than center of curvature—images in convex mirrors—why it is impossible to have an inverted image of one's face in a convex mirror.

7. Phases of Moon.

8. Refraction: Law for refraction—enlarged images produced by refraction—lenses—how reversed as well as enlarged images may be produced by refraction—principal focus—focal distance—conjugate foci—how a lens forms a picture—drop of water as a lens—twilight—telescopes—microscopes—eye glasses—spectrum—color.

9. Radiation: Electrical rays—heat rays—light rays.

10. Questions and Problems: Looking out over a landscape, a school house which was 75 ft. high was found to subtend the same angle as a stick 1.5 in. long at a distance of 10 in. from the eye. A tree standing beside the school house subtended the same angle as the stick held 20 in. from the eye. How far away was the school house? How tall was the tree?—An object

situated 40 in. from a luminous body is moved 10 ft. nearer to the light. How much more light does it intercept now than formerly? What is the relative intensity of the illumination in both cases?—Why are the images of trees seen in the water always inverted? How is the focus of a curved mirror affected by a change in the position of the source of light? When you look into the bowl of a silver spoon why do you never see a direct image of yourself?

VIII. Sound.

1. How Produced: All sounding bodies in a state of vibration—sound waves.

2. How Transmitted: Necessity for a medium—air of different densities—carbon dioxide, hydrogen—ether vapor as media—striking stones together under water—acoustic telephones.

3. Reflection of Sound: Echoes—multiple echoes—roll of thunder—whispering galleries—acoustic properties of rooms—calculating distance of reflecting objects by means of echo.

4. Intensity of Sound: On what does it depend? Resonators.

5. Wave Length of Sound: Calculated by sounding tuning-fork over air column—calculating velocity of sound from wave length.

6. Velocity of Sound: How affected?

7. Pitch: Siren—musical scale—pitch of the whistle of an approaching and receding locomotive.

8. Sympathetic Vibrations.

9. Vibration of Strings: Laws of vibration of strings—musical instruments—overtones—harmonics—quality.

10. Calculating Number of Vibrations of a Tuning-Fork.

11. Questions and Problems: What evidence have you from your own experience and from laboratory experiments that a medium is necessary to transmit sound? What evidence have you from every-day experience that pitch does not affect the velocity of sound? If sound travels at the rate of 1100 ft. per second, what is the wave length of a note that makes 512 vibrations per second? Describe the apparatus and experiment for recording the number of vibrations made by a tuning-fork. Name some of the principles of sound that are employed in the playing and tuning of a stringed instrument.

B. Review Class in Physics.

Many of the experiments performed in the general course are

quantitative. Some of these are reviewed and others are added. The following is a list of the experiments:

I. Mechanics.

1. To determine the ratio between an inch and a centimeter.
2. To determine the ratio between an inch and a meter.
3. To determine the ratio between an ounce and a gram.
4. To determine the ratio between a quart and a liter.
5. To determine the weight of a cubic centimeter of water grams.
6. Parallelogram of forces.
7. Friction between solid bodies on a level.
8. Coefficient of friction by sliding on incline.
9. The straight lever: first class.
10. Center of gravity and weight of a lever.
11. Breaking strength of wire.
12. Compressibility of air: Boyle's law.
13. The pendulum.

II. Hydrostatics.

1. Weight of unit volume of a substance.
2. Specific gravity of a liquid, specific gravity bottle.
3. Specific gravity of a liquid by balancing columns.
4. Lifting effect of water upon body entirely immersed.
5. Specific gravity of a body that will sink in water.
6. Weight of water displaced by floating body.
7. Specific gravity of block of wood by use of sinker.

III. Heat.

1. Specific heat of lead.
2. Determination of dew point.
3. Latent heat of melting ice.
4. Latent heat of vaporization.
5. Coefficient of linear expansion for brass.

IV. Magnetism and Electricity.

1. Lines of force near a bar magnet.
2. Study of a single fluid galvanic cell.
3. Study of a two-fluid galvanic cell.
4. Resistance of wire by substitution: various lengths.
5. Resistance of wires by substitution: cross-section.
6. Resistance by Wheatstone bridge.
7. Battery resistance.
8. Lines of magnetic force about a galvanoscope.

9. Study of a telegraph sounder.

V. Light.

1. Use of photometer.
2. Images in plane mirror.
3. Images formed by convex cylindrical mirror.
4. Image formed by concave cylindrical mirror.
5. Index of refraction for glass.
6. Index of refraction for water.
7. Focal length of a converging lens.

VI. Sound.

1. Wave length of sound.
2. Number of vibrations of a tuning-fork.

Chemistry

I. Oxygen and the Air.

1. Oxygen makes many things burn—air makes many things burn—products of burning in air and in oxygen—lime-water text—oxygen in the air—combustion—burning—rusting—oxides——metals increasing in weight when they rust—various rusts—methods of protecting metals from rusting—kindling temperature—miners' safety lamp—explosions—what is necessary for combustion?—how to put out a fire—fire extinguishers—various illustrations of phenomena of burning.

How oxygen is made from potassium chlorate—chemical change—physical change—mixture—air a mixture—first idea of symbols and equations from reaction for making oxygen from potassium chlorate—indestructibility of matter—catalytic action—law of definite proportions—oxidizing agents.

2. Questions and Problems: A piece of carbon weighing 24 gms. in burning unites with 64 gms. oxygen. What per cent. of carbonic oxide is carbon and what per cent. is oxygen?—If coal were 90% carbon how much oxygen would be needed to burn a ton of coal?—How might you prove that the air contains oxygen?—Discuss combustion, burning, rusting explosions—A test-tube 6 inches long is inverted over water; a piece of phosphorus is allowed to rust in the air enclosed in the tube. At the end of several days it is found that the water has risen 1.2 inches. What per cent. of the air has been used up by the rusting of the phosphorus? If we direct a flame towards the test-tube till the phosphorus melts, will it burn? Why?—Name several observations common

to every-day experience that lead to the conclusion that air is necessary for burning.

II. Hydrogen and Water.

1. Hydrogen from zinc and sulphuric acid—general principle for making hydrogen—general formula for acids—chemical equations—meaning of chemical equation—combining weight—molecular weight—atom—molecule—problems involving weight and volume—metric system—liter—weight of liter of hydrogen and air—reducing agents—combustion of hydrogen—product of combustion.

2. Water—analysis and synthesis—hydrogen from water by means of sodium—hydrogen from water by means of iron—hydrogen and oxygen from water by electrolysis—ionization—proportions of hydrogen and oxygen in water by volume—formula for water—meaning of chemical formula—product of burning hydrogen—hydrogen over hot copper oxide—proportions of hydrogen and oxygen in water by weight—relative weights of equal volumes of hydrogen and oxygen—eudiometer—burning of hydrogen in oxygen and oxygen in hydrogen—terms "combustible" and "supporter of combustion" as applied to gases are relative and interchangeable—efflorescence—deliquescence—water of crystallization.

3. Questions and Problems: How would you show that there is hydrogen in a candle? A liter of water weighs 1000 gms. How many liters of hydrogen and oxygen will be produced by the decomposition of a liter of water?—What ratio of hydrogen to air would make the best explosive mixture?—How many liters of hydrogen would be produced by the action of 49 gms. of sulphuric acid on zinc? A certain gas in burning united with 64 gms. of oxygen and produced 44 gms. of carbon dioxide and 36 gms. of water. Of what two elements was the gas composed and in what ratio by weight were they united in the original compound?

III. Chlorine and Chlorine Family.

1. Halogens—what constitutes a family of elements?—periodic law—chlorine and hydrochloric acid—bleaching—disinfecting—action of chlorine on metals—enlarged idea of combustion—bromine and hydrobromic acid—iodine and hydriodic acid—general principle of making acids—iodine on starch—hydrofluoric acid—etching of glass—active and inactive elements—

stable and unstable compounds—oxidizing agents—law of volumes of Gay Lussac—Avogadro's law—Boyle's law—how to find the weight of a liter of an elementary and compound gas—corrections for temperature and pressure.

2. Questions and Problems:

How many liters of chlorine will be produced by the action of 20 gms. of manganese dioxide on salt and sulphuric acid?—How much sulphuric acid and salt will be required to go with 10 gms. of manganese dioxide?—"Chloride of lime" is a good agent for bleaching and disinfecting. What inference concerning chlorine would you draw from this fact?—Explain what happens when sulphuric acid is added to a solution of potassium iodide containing starch. Why may chlorine water be substituted for the sulphuric acid?—How would you distinguish by experiment between the chloride and the bromide of sodium?

IV. Acids—Bases—Salts.

1. General formula for acids, for bases, for salts—neutralization—use of indicators—normal, neutral, and acid salts—chemical nomenclature—acid-forming elements—base-forming elements—monobasic and dibasic acids—valence—electrolytic dissociation.

2. Questions and Problems:

What is an acid? a base? a salt? Give three reactions to illustrate the relations between them—Name another method by which salts are produced than by the neutralization of an acid by a base—How much caustic soda would be required to make an ounce of common salt? Given ammonium nitrate, sodium chloride, potassium hydroxide, and sulphuric acid, how would you make nitric acid, hydrochloric acid, sodium sulphate, and potassium nitrate? Write equations—Hydrogen is evolved by the action of sulphuric acid on zinc but not on zinc oxide. Explain the reason for this difference.

V. Sulphur.

1. Physical properties—allotropism—sulphur dioxide—sulphur trioxide—law of multiple proportions—sulphurous acid—sulphuric acid—manufacture of sulphuric acid—oxidizing agents—catalytic action—action on metals—sulphides—hydrogen sulphide—hydrogen sulphide from cooking eggs and from soft coal—sulphur springs—nascent state—use of hydrogen sulphide in qualitative analysis.

2. Questions and Problems: Outline two commercial methods for making sulphuric acid—How would you make hydrogen sulphide in the laboratory? Sketch apparatus and write reactions—Why is hydrogen sulphide used instead of free sulphur in making sulphides of the metals?—Why is hydrogen sulphide valuable for showing what things are made of? Anhydrides?

VI. Nitrogen.

1. Nitrogen a constituent of atmosphere—other constituents of atmosphere—air a mixture—value of nitrogen to plant and animal life—nitrates—how nitrates are replenished in certain soils—nitric acid—instability of nitric acid—Oxidizing agents use of nitric acid to raise valences—nitrogen per oxide—use of nitrogen per oxide in manufacture of sulphuric acid—instability of nitrogen compounds—explosives—gunpowder, fireworks, etc.—ammonia from ammonium compounds—metallic properties of "ammonium"—What is a metal? Tests for ammonium group in certain salts and in baking powders—smelling salts—"ammonia water."

2. Questions and Problems: How would you test an unknown substance to determine whether it were an ammonium compound. Given ammonium nitrate, potassium hydroxide, and sulphuric acid, how would you produce from these nitric acid, ammonia, potassium nitrate, and ammonium sulphate?—What is meant by an oxidizing agent? Give examples—Why are nitrogen compounds used in the manufacture of explosives?—What volume of nitrous oxide could be made from 16 gms. of ammonium nitrate? Give another name for nitrous oxide and state some of its physical and chemical properties.

VII. Carbon, Carbon dioxide, Carbonates.

1. Carbon—hydrocarbons—sulphuric acid on sugar—petroleum—destructive distillation of wood, sugar, and paper—flames—alcohols—manufacture of illuminating gas—coke—coal tar—aniline dyes—phenols—reducing agents—extracting metals from their ores.

2. Carbon dioxide and Carbonates: Methods of producing carbon dioxide—where found—lime-water test—hard water—permanent and temporary hardness—action of soap on hard water—softening hard water—stalactites and stalagmites—mineral waters—baking powders—Rochelle salts—seidlitz powders—"soda" water—quicklime—mortar—plaster.

3. Questions and Problems: How may we prove that diamond is carbon? State in general how metals are extracted from their ores—Given the problem of proving in the laboratory that a certain gas is a compound of carbon and hydrogen, state your method of procedure, describe apparatus used, and write reactions—Why is a glass pitcher in which hard water is used so liable to show spots about the mouth? Why is vinegar good to clean with? Describe an experiment to show how mortar plaster and whitewash on the walls become limestone.

VIII. Fermentation.

1. Decomposition—yeast—cane sugar—fruit sugar—action of yeast on molasses—other ferments—souring of milk—alcoholic fermentation—alcohol—vinegar—theory of vaccination.

2. Questions and Problems: To what class of substances do the sugars belong? Write a general formula for all members of this class—Explain the action of sulphuric acid on sugar syrup—What is meant by the process of alcoholic fermentation? Write reactions to show how acetic acid is formed from ethyl alcohol—What is the percentage composition of ethyl alcohol? How might you show by experiment that it contains carbon?

IX. Potash and Soap.

1. Potassium carbonate from wood ashes—lyes—fats—soap the result of neutralization—soaps are salts—soap from lard and sodium hydroxide—hard soaps—soft soaps—use of soap in cleaning—action of soap on hard water—soap used to soften water—glycerine.

2. Questions and Problems: To what class of chemical compounds do soaps belong?—What is meant by saponification?—Write a general reaction to show what takes place when soap is made—Explain the action of soap on hard water—What is the difference between hard and soft soaps?

In addition to the above, sets of questions are from time to time given out for general review. These are often taken from specimen examination sheets and are answered sometimes independently and sometimes with the aid of reference books. Usually such a sheet is given out at the conclusion of each topic. The pupils are also given problems for home work. The problems deal with such subjects as percentage composition; percentage composition of molecules containing water of crystallization, calculating simplest formulas of compounds;

finding the weight of a liter of a gas from the molecular weight of the gas; corrections for temperature and pressure.

Definitions are formulated and learned as necessity demands but are in general left for review work at the end of the course.

Development of the Subject

I. Physics—Specific Heat.

The topic Specific Heat is taken up somewhat as follows:

1. Lecture (40 minutes).

Observations cited from every-day experience to show that some substances take longer to heat than others—Experiences at seashore show that sand heats faster and cools quicker than water—Then sand must reach a certain temperature sooner than water—Then water at a given temperature must contain more heat than sand at that temperature—What is meant by "more" heat? How heat is measured—Difference between temperature and quantity of heat—Unit of heat—Quantity of heat involves both mass and temperature—Heat capacity—Capacity of various substances for heat—Water as the standard—Meaning of "Specific Heat."—How to find specific heat of a substance.

The apparatus for finding specific heat of lead would be at hand and would be referred to in the explanation of the method. The experiment could be performed if time allowed but this would not be necessary. At the introductory lecture of certain topics many illustrative experiments are necessary but when one definite experiment like that in specific heat is to be performed in the laboratory at the next exercise it seems unnecessary to run through it in the lecture.

At the close of the lecture an assignment from the text-book would be made to be read before the next lesson.

2. Laboratory Period (80 minutes).
   (a) Review of lecture and text-book assignment by means of short quiz.
   (b) Explanation of apparatus for experiment which is to follow (20 minutes).
   (c) Supplementing the printed directions for experiments with necessary precautions.
   (d) Performing experiment according to following directions and recording results in note-book (40 minutes).

Experiment: Have 200 cubic centimeters of water at the

temperature of the room in each of two metal vessels (calorimeters). (Bright metal cups will serve the purpose.) Note the temperature. In a third vessel have 200 cubic centimeters of water with a piece of lead in it weighing 200 gms. Have a thread attached to the lead so that you may transfer it from one vessel to another. Cover this third vessel to prevent loss of water by evaporation and heat it nearly to the boiling point of water. Remove the lamp and take the temperature of the water and lead and quickly transfer the lead to one of the former vessels of water and into the other pour the hot water. Stir the hot and cold water together and move the lead about for a few minutes to make the temperature in each uniform. Now note the resulting temperature in each. Calculate from the above results the specific heat of lead.

(e) Discussion of experiment and sources of error in performing it by above method. How to eliminate errors preparatory to performing experiments in a more refined way at next laboratory exercise. (20 minutes).

(f) Copying a few simple problems on specific heat for home work to be handed in at next exercise.

3. Laboratory Period (80 minutes).

(a) Copying from board on an extra sheet of paper if necessary to be inserted in note-book, the data for more refined method of performing experiment of finding S. H. of lead (10 minutes). To find S. H. of lead by solving following:

Heat lost by lead =
Heat gained by water +
Heat gained by calorimeter.

(b) Performing and recording experiment (50 minutes).

(c) Finding class average for S. H. of lead (10) minutes.

(d) Questions from class and assignment of lesson for next time (10 minutes).

This lesson for home work will be a mimeograph set of questions and problems on specific heat taken from various sources, largely specimen examination papers. To answer them the student may refer to the various text-books on the laboratory reference shelves or in his own library.

4. Quiz Period (40 minutes).

Oral review and discussion of questions given out at the last exercise.

Laboratory note-books handed in for inspection and correction before next exercise. The note-books are examined by the instructor and corrections are made in red ink. The student is not expected to rewrite his notes but to confer with the teacher regarding the corrections.

How laboratory work is conducted.

In performing experiments like the foregoing the students would be advised to work in twos to facilitate manipulation. The laboratory would be equipped for this exercise with this in view—one set of apparatus for every two students. Wherever it is consistent with the best work, however, the students are advised to work absolutely independently and the laboratory is generally equipped with sufficient apparatus to allow of this method. The student is not provided with a set of apparatus at the beginning of the year but finds the laboratory equipped for certain topics at various exercises. For instance, he may find all the apparatus for "Effects of Heat." He is expected to adjust himself to what is at hand and to finish the topic at the end of a certain number of exercises By this means each student has access to every piece of apparatus.

II. Chemistry—The topic Chlorine and the Chlorine Family is taken up somewhat as follows:

1. Lecture (40 minutes).

Experiment of making chlorine—precautions to be used—physical properties—experiments to show its attraction for metals—activity of chlorine—chlorides—bleaching—disinfecting—value of chlorine—its attraction for hydrogen.

Text-book assignment.

2. Laboratory Period (80 minutes).
   (a) Review of lecture and text-book work. Directions for experiments. Supplementing the printed directions with oral directions and precautions (20 minutes).
   (b) Making apparatus if the student has not the piece already on hand from his experiments with oxygen and hydrogen. Performing and recording following experiments: (60 minutes.)

Experiments: In a two-ounce flask put about a tea-

spoonful of mixture of manganese dioxide and common salt (using for the mixture a slightly larger volume of the manganese dioxide than of the salt). Pour upon it enough of the dilute (1 to 1) sulphuric acid to cover the powder. Heat very gently and collect the gas that is generated in an inverted eight-ounce bottle of water. Note the color and odor of the gas. Sprinkle into it a little of the powdered metal antimony. Cover the bottle with a wet paper to prevent the escape of the gas.

In the eight-ounce bottle put about a teaspoonful of chloride of lime and pour upon it about half a teaspoonful of dilute, sulphuric acid. Hang in the bottle strips of wet calico and strips of paper with ink marks upon them. Cover the bottle with a piece of wet paper to prevent the escape of the gas.

Assignment of home work—problems from reaction for making chlorine.

3. Quiz and Lecture (40 minutes).

Review of chlorine—hydrochloric acid by direct combination and by metathesis—other members of chlorine family bromine and iodine—text-book assignment on hydrochloric, hydrobromic, and hydriodic acids.

4. Lecture (40 minutes).

Hydrochloric acid—hydrobromic acid—hydriodic acid—hydrofluoric acid.

5. Laboratory Period (80 minutes).

(a) Review. Discussion of experiment to be performed (20 minutes).

(b) Directions for making apparatus. Making apparatus and performing and recording following experiments (60 minutes).

Experiments: Collect an eight-ounce wide-mouth bottle of hydrogen. Generate chlorine in the usual manner. Light the bottle of hydrogen and slowly thrust the tube of the chlorine generator up into the bottle of hydrogen. Does a flame persist at the end of the delivery tube? Is this combustion? What was formed in the bottle during the experiment?

In a two-ounce flask put about a teaspoonful of common salt and pour upon it about a tablespoonful of sulphuric acid. Warm very gently and conduct the gas which will be produced into a test-tube containing water to the depth of one inch. The gas is so soluble in cold water that it will probably all be absorbed. Immerse the test-tube in a bottle of water to keep it cool. Pour half of the liquid thus obtained into a second test-tube. Into the first drop a few pieces of zinc and test for hydrogen by bringing a flame to the mouth of the tube. Into the second drop a little manganese dioxide and warm the mixture. Can you get the odor of chlorine at the mouth of the tube?

6. Lecture (40 minutes).

Study of formula of hydrochloric acid—law of volumes of Gay Lussac—Avogadro's law.

For home work, text-book assignment on above topics.

7. Quiz (40 minutes).

Review of home work. Discussion of a sheet of questions bearing on laws discussed in last lecture. Molecular and atomic weights.

8. Laboratory Period (80 minutes).

(a) Preliminary talk on action of starch on iodine. Review of reactions for making hydrobromic acid and hydriodic acid (20 minutes).

(b) Performing and recording following experiments (60 minutes).

Experiments:—Make hydrobromic acid and bromine in open test-tubes using very small quantities of the materials. Note color and odor of products. Note that hydrobromic acid is so unstable as to yield bromine vapor when heated without manganese dioxide.

Make hydriodic acid and iodine by the same method as used in the previous experiments. Hydriodic acid is even more unstable than hydrobromic.

Make a very dilute starch solution. Add to some of it a few drops of a solution of iodine in water and to another portion of it a few drops of a solution of iodine in alcohol. To a dilute starch solution add a few drops of a solution of potassium iodide. Then add a little

sulphuric acid. Explain what happens. See if chlorine water may be substituted for the sulphuric acid.

For home work, text-book assignment on hydrofluoric acid and etching of glass.

9. Lecture (40 minutes).

Comparison of physical and chemical characteristics of members of chlorine family. Family of elements. Periodic Law. Fluorine—Hydrofluoric acid and etching of glass.

Assignment for home work:—General review for quiz to come later.

10. Quiz (40 minutes).

Review of reactions for making hydrofluoric acid and etching glass. Preparing small tumblers for etching according to following directions. (Tumblers left to be etched by instructor.)

Directions:—Warm the bottom of a tumbler and melt upon it a thin coating of paraffin. Allow it to cool and draw some characters in the paraffin, being sure to cut through to the glass.

11. Laboratory Period (80 minutes).

(a) Questions from pupils on chapter just completed (20 minutes)

(b) Written quiz (60 minutes).

Laboratory books to be handed in for inspection and correction. The corrections are made by the instructor or an assistant. The student is not supposed to rewrite his notes but is expected to consult with the teacher concerning the corrections.

How laboratory work is conducted:—The chemical laboratory work is conducted somewhat differently from the physical in that at the beginning of the course each student is provided with a certain amount of apparatus and material from which he constructs his own simple apparatus. Except in a very few cases the work is entirely individual.[1] M. B. V. A.

[1] The syllabus of the course in general physics is made from Woodhull and Van Arsdale's *Physical Experiments*, published by D. Appleton & Co., and most of the experiments and problems here recorded are taken from the same book.

The syllabus of the course in chemistry is made from Woodhull and Van Arsdale's *Chemical Experiments*, published by Henry Holt & Co., and most of the experiments and problems here recorded are taken from the same book.

PHYSICAL TRAINING IN THE HORACE MANN HIGH SCHOOL

Introduction and Aims

Physical Education has become recognized as an essential factor in education. The general effects of a systematic course of physical exercises wisely directed have warranted its introduction as a required part of the school curriculum.

Without the soundest physical basis it is impossible to have the best mental development. At no time, therefore, in the life of an individual is the physical condition of more vital importance than during the years usually devoted to high school study. It is then that nascent powers are manifesting themselves and characteristics of thought and action, of posture and bodily form are crystallizing into habits, posture, and form which will typify the man and woman of later years. The first aim of the course in Physical Training, therefore, is to foster a condition of vigorous health and to so increase and regulate the organic powers that the best physical condition for growth both mental and physical may result.

A condition favorable to health and growth alone, however, is not sufficient. Growth, as far as possible, must be directed and the strength of the weaker parts of the body so augmented that the result is an harmoniously developed whole. The course in Physical Training aims, accordingly, in the second place to check abnormal tendencies in posture and form, to strengthen defective portions, and thus in the end to favor a symmetrical physical development with a fair degree of endurance.

The whole individual is reached through his motor activities and is involved in them no less than in purely mental efforts. Physical Education, accordingly, to be educative in the fullest sense must aim not alone at bodily culture but mind instruction as well. It should make of prime importance neuro-muscular development which is very largely acquired during the years of physical growth. This, then, is the third aim of the course; to contribute largely to ready physical control, physical judgment, presence of mind, strength of will, and self-reliance.

The course in the fourth place is designed to offer opportunity for recreation through free play, games, and physical exercises.

The course is graded and progressive. It has been planned to conform to the laws of growth and development and arranged to meet the needs of boys and girls of different ages. Attendance is required of all students and one point credit is given for the successful completion of each year's work.

Physical Examinations

Each child at the beginning of the school year is required to submit to a careful physical examination. This examination includes information about the pupil's health and habits and makes known his general physical condition, his muscular strength, and any organic weakness or abnormal tendencies in physical growth. The records of these examinations are preserved and by comparison with the records of previous years the increase in growth and strength as well as change in abnormal tendencies may be noted. A basis is thus given for special work and advice. While in the regular class work but little opportunity is given for direct attention to individual development and the aim is rather to reach all through the general development of the whole class, the individual is not neglected and wherever special attention is needed it is carefully given. A second examination during the year may be taken at the student's request and is often demanded by the instructors. In this way the physical condition and tendencies of each pupil are known and the work and play so arranged for him that the possibility of overwork or straining through too severe exercises is practically eliminated and the results attained are those most beneficial to him. Results of those examinations which have disclosed any serious weakness or great departure from the normal are made known to the parents of the pupils.

Optional Work

Optional work in the gymnasium and athletic sports in the open air are encouraged as an essential part of the complete physical education. During the late fall and winter months two periods each week are set aside for each student in which to take free exercise in the gymnasium. These periods come

at the close of the regular school session. While this work is at all times under the direction of an instructor, no formal class work is attempted and valuable opportunity is given for free play and recreation. Games and exercises on various pieces of apparatus engage the attention of the students at these periods. The attendance is large and the work done is believed to be a valuable supplement to the more formal class work of physical training.

Girls: The optional work of the girls consists largely of basket-ball, which is carefully coached according to the authorized rules for women.

No girl is admitted to this practice until she has satisfactorily passed the special examination of heart and lungs and been found physically fitted for such an active game.

The fall and early winter are devoted to preliminary practice and coaching, after which a "First" team is chosen from each class and there follows during the remainder of the winter a series of inter-class games played for the championship of the school.

The girls of the school have an opportunity to use the swimming-pool and handball courts and, in the fourth and fifth years, the fencing-room.

The number of girls actively interested in some kind of outdoor athletics is increasing, and an effort is being made to encourage this as much as possible by giving each one an opportunity for becoming familiar with several forms of athletic sports.

This optional work in addition to the more formal gymnastics will make the amount of actual vigorous exercise for each girl average at least one hour daily.

Boys: To basket-ball is given the largest share of effort. In addition to the "First" team, which plays a schedule of games with other schools, each class has an organized team. An inter-class series is played for the championship of the school. The members of the "First" team, however, are not allowed to participate in these games and as a result many who are incapable of playing on the regular school team are interested. The class teams together with the second teams from each class and the many others actively interested in basket-ball include the large majority of the students.

Provision for handball is ample. Two tournaments are played during the winter and the winners of these play for the championship of the school. Many who are not interested in basket-ball enter with spirit into this game. Running, jumping, hurdling, etc., interest others who are preparing for indoor athletic meets.

Football, baseball, and track athletics afford means for valuable outdoor exercise during the pleasant weather of the fall and spring. The previous fall three football teams were organized and played games with other schools. Each class has its baseball team while the school is represented by its regular "First" team. The track and field games of the school held in May engage the attention of many of the students during the spring months.

No pupil is allowed to represent the school on any of its athletic teams who has not passed a thorough physical examination and who is not doing satisfactory work in all his studies.

Probably less than a fifth of the boys of the school are not actively interested in some athletic sport during the course of the year. This work is optional, but a direct effort is made to interest all in it as it is thought this training has a direct educational as well as hygienic and moral value. The work of the different teams is carefully directed and some member of the faculty is present at all the games and usually at each practice. This is made possible by the fact that on the teaching force is a number of men who have been prominent in college and university athletics and who are at all times willing to co-operate and take pleasure in coaching the various teams.

Taking into consideration the formal class work in physical training supplemented by the optional work at the gymnasium and the outdoor sports during the pleasant weather but few days pass in which it is not possible for each student to take at least one hour's vigorous exercise under supervision and direction.

E. B.
E. F.

Synopsis of Course

During the early part of each year a thorough review is made of the fundamental positions in walking and standing and the more essential of the free movements as well as the more basal

exercises on the apparatus of the previous year's work are again gone over before taking up the new work of the course.

BOYS

First Year

Free Exercises.

1. Marching and class formations.
2. Drill of free exercises. (This drill is never memorized but is varied each day by the introduction of new movements and combination of movements. The new exercises are first demonstrated to the class and the commands for them explained, after which they are executed at the command of the teacher.)
3. Mat exercises.
4. Indoor athletics.
   1. Running.
   2. Jumping.
   3. Hurdling.

Hand Apparatus.

1. Wooden dumb-bells.
2. Wooden wands.
3. Medicine balls.

Heavy Apparatus.

1. Swedish boom.
2. Stall bars.
3. Ladders.
4. Giant stride.
5. Buck.
6. Vaulting box.
7. Vaulting bars.

Games.

1. Games with medicine balls.
2. Handball.
3. Basket-ball.
4. Free games.

Swimming.

Second Year

Free Exercises.

Continuation of the work of the first year.

Heavy Apparatus.

Continuation of the work of first year with the addition of introductory work on the vertical ropes preparatory to climbing.

Games (see first year).

Swimming.

Third Year

Free Exercises.

Continuation of work of the previous years with the addition of "fancy steps."

Hand Apparatus.

Continuation of work of the previous years with the addition of Indian clubs.

Heavy Apparatus.

Continuation of work of previous years with the addition of vertical ropes and rings.

Games (see first year).

Swimming.

Fourth Year

Free Exercises.

Continuation of work of previous years with the addition of "fancy steps."

Hand Apparatus.

Continuation of work of the previous years.

Heavy Apparatus.

Continuation of work of previous years with the addition of the horse and parallel bars.

Games (see preceding year).

Swimming.

Fifth Year

Free Exercises.

Continuation of work of previous years.

Hand Apparatus.

Continuation of work of previous years with the addition of poles.

Heavy Apparatus.

Continuation of work of the previous years.

Games (see preceding year).

Swimming.

GIRLS

First Year

Free Exercises.

1. Marching and class formations.
2. Standing free exercises.

   These vary daily and are intended to exercise in equal proportion the principal groups of muscles. Special attention given to securing correct fundamental position.
3. Mat exercises.
4. Dry land swimming in preparation for use of swimming-pool.
5. Classic dancing.

6. Indoor athletics.
    1. Running.
    2. Jumping.

Hand Apparatus.

1. Wooden dumb-bells.
2. Wooden wands.
3. Medicine balls.

Heavy Apparatus.

1. Swedish boom.
2. Stall bars.
3. Ladders.
4. Grand stride.
5. Balance boards.
6. Buck.

Games.

1. Games with basket-ball and medicine balls.
2. Handball.
3. Basket-ball.
4. Free games.

Swimming.

Second Year

Free Exercises.

See first year.

Hand Apparatus.

Continuation of work of the first year with the addition of Indian clubs (simple introductory movements).

Heavy Apparatus.

Continuation of work of first year with addition of vaulting bar, flying rings.

Games (see first year).

Swimming.

Third Year

Free Exercises.
See first year.

Hand Apparatus.
Continuation of work of second year with addition of bounding balls and bar balls.

Heavy Apparatus.
Continuation of work of second year with addition of horse (simple jumps and vaults).

Games (see preceding years).

Swimming.

Fourth Year

Free Exercises.
Continuation of work of third year with addition of fencing (elementary).

Hand Apparatus.
Continuation of work of third year with addition of poles.

Heavy Apparatus.
Continuation of work of third year with addition of parallel bars (simple preliminary work).

Games (see preceding years).
Tennis.

Swimming.

Fifth Year

Free Exercises.
Continuation of work of fourth year with addition of fencing.
1. By command.
2. Beginning of assault.

Hand Apparatus.

Continuation of work of fourth year with addition of iron wands and bar bells.

Heavy Apparatus.

Continuation of work of fourth year with addition of flying rings, traveling rings, and combinations of booms and ropes, jump stands, rings, etc.

Games (see fourth year).

Swimming.

PHYSIOGRAPHY IN THE HORACE MANN HIGH SCHOOL

Geography, or the study of the earth in its relation to life, is, as is evident from the terms of the definition, a broad subject and necessarily encroaches upon the field of related sciences. In the consideration of "the earth" we may invade the province of astronomy, physics, geology, etc.; in "life" that of botany, zoölogy, or anthropology.

The place of physiography in the curriculum, therefore, is determined by the nature of the subject for it naturally follows those sciences upon which it, in a measure, depends. In the Horace Mann High School it is studied in the fifth year of the course following the physical sciences and biology. The subject is elective and covers a term of one year with four periods weekly of forty minutes each.

The work presented is based on the suggestions submitted by the committee appointed by the Middle States Examination Board to outline the requirements for college entrance in physiography. The course therefore prepares for any college accepting physiography as an entrance subject.

The chief aim however is not to prepare for college. No subject illustrates more clearly the relation between cause and effect than does geography. The pupil does not observe a fact or deduce a principle mainly for the sake of that fact or principle but as a necessary step toward some greater problem ahead. He learns not only that certain consequences follow certain causes but that there is a necessity in their following. An opportunity is thus given him to collect facts, to deduce principles and to verify them, and in the light of the knowledge gained to interpret new problems. The mental discipline thus afforded is invaluable and so treated geography becomes more than an information subject.

The method pursued is that of the laboratory as far as is practicable. The subject to be studied is presented in the form of problems and exercises to be solved individually by the student in order that an opportunity may be given him to arrive at generalizations independently through the detailed study of many facts. Certain topics which do not lend themselves to laboratory treatment are developed orally in the classroom

or are assigned as library work. Field work, under the guidance of the teacher, is also a required part of the course. Recitations are based upon laboratory and field work, upon class discussions and assigned reading.

The following series of exercises illustrates the method pursued. The problems are based on climatic maps which may be found in practically all of the more recent Physical Geographies.

Isotherms—January Map

1) Record the temperature of the eastern coast, the western coast, and the interior of North America along the parallels of 30, 40, 50, 60, and 66½ degrees.

2) Record the temperature of the eastern coast, the western coast, and the interior of Eurasia along the parallels of 40, 50, 60, and 66½ degrees.

3) Compare the temperature of the east and west coastal regions of North America; compare each coast with the interior; compare the east and west coastal regions of Eurasia; compare each with the interior.

4) What is the trend of the isotherms in the interior of these continents? Over the adjacent oceans? Suggest the reason for their irregularity.

5) Where is the coldest land area found? What is its temperature? Where is the warmest land area found? Record its temperature.

6) Compare the trend of the isotherms in the northern and southern hemispheres. Explain.

7) On an outline map of the world indicate the position of the heat equator.

The study of the distribution of temperature over the world for July and for the year follows that for January and is similar in character. Pressure, depending upon temperature, is naturally the next topic for consideration.

Isobars for January

1) Locate the equatorial low-pressure belt. What is the average temperature of this area? (See Isothermal map for January.) Where is pressure lowest in this belt? What is the temperature of these areas?

2) Locate the barometric equator. Compare its position with that of the January heat equator.

3) Locate the north tropical belt of high pressure. Describe the temperature of this belt. Where is pressure highest? What is the temperature of this area?

4) Compare the south tropical high-pressure belt in extent and continuity with the north tropical. Explain.

5) Describe the pressure about the poles.

The study of pressure and its distribution for July and the year is similar to that for January. At the completion of these exercises the relationship between temperature and pressure is evident to the pupils. The apparent exception to this relationship, low pressure at the poles, must be explained as the cause cannot be discovered in the laboratory.

The study of pressure is followed by that of the wind systems.

Winds

Planetary.

Draw a circle representing the earth. From your knowledge of the average distribution of pressure over the world for the year and of the law of deflection show the approximate direction of the winds. Verify from consultation of wind chart and correct errors.

Terrestrial.

Construct two diagrams showing the effect of the migration of the heat equator upon the planetary wind system.

(Diagrams should represent the distribution of winds for January and for July.)

Monsoons.

Draw two outline maps of India. In each case represent the mathematical equator. On one map represent the heat equator for January and the consequent distribution of winds for the same month. On the second map represent the heat equator and winds for July. Verify as before and correct errors.

Rainfall

1) Account for the amount of precipitation in regions of greatest and least rainfall.

(Consult map of winds and physical maps as well as rainfall maps.)

2) Compare the extent of desert regions of the eastern and western hemispheres. Explain.

3) Locate the great trade-wind deserts.

4) Explain the distribution of rainfall along the western coast of South America.

5) Compare the amount of rainfall east and west of the 100th meridian west of Greenwich. How have life conditions in this section been influenced by the amount of rainfall?

6) State the amount of rainfall in the Great Basin region of the United States. What has been the influence of the light rainfall upon the drainage of this section?

These exercises have been arranged to show the dependence of pressure on temperature, of winds on pressure, of rainfall on winds and surface features. They are illustrative, however, not only of the work on the atmosphere but of that of the other departments of the subject as well, for they emphasize causes and consequences—the vital element in geography limited to no one department but common to all.

The subject is divided in five parts—*i.e.*, The Earth as a Globe, The Atmosphere, The Ocean, The Lands, and The Distribution of Life. Each portion is treated in sufficient detail to give the student an understanding of the principles involved and of their application, though not all receive an equal amount of emphasis. The greater proportion of time is devoted to the atmosphere and to the land, the former affording the best of opportunities for close observation, the latter deserving careful study owing to the many relationships existing between this portion of the earth and human life.

The sequence of topics must frequently be varied in order to accommodate the work to the season. Land forms should be studied in the fall or the spring that an opportunity for field work may be given. The last division of the subject, The Distribution of Life, is not reserved in its entirety for the culmination. Whenever it is possible the relation of life to the section studied or the influence of a certain physical fact upon life is emphasized. The final topic is therefore, for the most part, a summary and an amplification of the applications which have been made throughout the work.

A brief outline of the subject is given below.

The Earth as a Globe

Shape: evidence of form, consequences of the shape.
Size: measurement of the earth; consequences of the size of the earth upon life.
Motions: proofs and effects of rotation; effects of revolution and inclination of the axis.
Laboratory work is made the basis of this part of the course. The following problems illustrate the character of this work.

Exercise on Light Distribution

Construct a diagram representing the distribution of light over the world at the summer solstice.

State the length of day and night at the equator, at the tropic of cancer, at the tropic of capricorn, at your own latitude, at the arctic and antarctic circles.

Compare the length of day and night of New York, London, New Orleans.

Compare the time of sunrise and sunset of New York and a point in the same latitude and longitude south of the equator. When have these places sunrise simultaneously?

The Atmosphere

Composition
Temperature: sources of heat; instruments for measuring temperature; distribution over the earth as represented by isothermal lines; distribution of heat equators.
Pressure: instruments for determining pressure; distribution as represented by isobaric lines; dependence of pressure upon temperature.
Winds: cause of circulation of air; planetary, terrestrial continental, and diurnal winds—their dependence upon pressure; storms of the westerly and trade-wind belts.
Rainfall: evaporation; condensation; forms of moisture; distribution of rainfall over the earth and its dependence upon temperature, winds, and surface features.
Climate: heat belts; climatic conditions of each belt.
The work on the atmosphere is again based on laboratory

exercises.[1] A special study is made of the weather conditions of the United States by means of the government weather maps and also through the construction of weather maps from data illustrating special features.

The Ocean

General characteristics: form of basins; divisions; depth; temperature,—surface and deep sea.

Waves: cause of motion; orbital movement of water particles; swell; surf; earthquake waves.

Currents: cause of currents; division of the ocean according to currents; currents of the various oceans; effect upon temperature.

Tides: cause of tides; high and low tides; interval between high tides; spring and neap tides.

The following exercise is typical of the method of work on the ocean.

Ocean Currents

1) On an outline map of the world represent the distribution of the fundamental wind systems.

Judging from the direction of the winds sketch in lightly the general directions of the ocean currents.

Verify your conclusions by consulting an accurate map of ocean currents and fill in details.

2) Sketch two outline maps of the North Indian Ocean. On one represent the winds and ocean currents for January, on the other for July.

Verify and complete as in the preceding map.

The Lands

General features: distribution of land and sea; comparison of vertical and horizontal extent of land.

Plains:

Coastal: classes, typical illustrations and development of each; relation of life to coastal plains.

Plateaus:

Classes; illustrations; development and life relations of each class.

[1] See preceding series of exercises on the atmosphere illustrative of the method pursued.

Mountains:

Classes; illustrations; development and life relations as before; climate of mountains compared with plains.

Volcanoes:

Distribution of volcanoes; young, dissected, and worn down volcanoes; lava plains and plateaus.

Valleys:

Ground water and its work; surface streams; classification; characteristic features of each stage of development; alluvial plains and lake plains; relation of life to rivers and valleys.

Glacial Deposits:

Origin; formation of glaciers; classification of glaciers; work and effects of glaciers; extent of the ancient ice sheet in North America; evidence of its presence in the vicinity of New York.

Shore Lines:

Shore lines of elevation: illustrations; characteristic of various stages of development; life relations.

Shore lines of depression: illustrations; characteristics; development; life relations.

United States topographical maps, models of the various land forms, and photographs are made the basis of the laboratory work on the lands.

The following exercise on mature rivers is given as an illustration of the method pursued in the work on land forms. The problems for the most part are to be studied from the maps of the lower Mississippi published by the Mississippi River Commission.

Lower Mississippi Valley

1) Construct a cross section about ten miles in extent cutting through the river. (Donaldsonville sheet.) Vertical scale $\frac{1}{10}$ in. = 10 ft. Compare vertical scale with horizontal.
2) Write a description of the river noting the following points:
   a) Grade (use large scale map and determine fall per mile).

b) Course.
  Nature of curves.
  How shortened.
    Possible effect upon river ports.
  How lengthened.
    Importance of this fact.

c) Lakes.
  Relation to river.
  Stages of development

d) Islands.
  Formation.

e) Valley.
  Width.
  Depth.
  Slope of land with reference to river.
  (Compare with the Deerfield River and account for differences.)
  Explain the course of the Yazoo River.

f) Alluvial plain and delta.
  Extent.
  Productiveness.

g) Location of large towns. Explain.

h) Classification as to age. State reasons for your opinion.

i) Comparisons of other great streams with the Mississippi.

LIFE DISTRIBUTION

Distribution of plant life over the world; distribution of animal life; adaptation of plants and animals to climatic conditions; aids to migration; barriers to migration; influence of climate upon man; influence of surface features upon man; importance of geographical factors in history with special reference to the United States.

C. B. K.

PHYSIOLOGY IN THE HORACE MANN HIGH SCHOOL

The course in Physiology as outlined below is required of all pupils in the first year of a five years' course in the high school. Three forty-minute periods per week for one year are assigned to the work.

Aim.—The aims of this course are, first, to give the pupils a knowledge of the essential facts of Physiology with special reference to the life and health of the human body, second, to give them as much training as possible in the scientific method.

Method.—The pupils meet in the laboratory and as far as is possible the laboratory method is used. Because of the age of the pupils and the nature of the work it is not considered feasible and advisable for each pupil to perform the experiments. The plan used is as follows:—Each pupil has a ruled note-book for diagrams and accounts of the experiments demonstrated by the teacher before the class. The *object* of each experiment is dictated by the teacher and the pupils make their own notes on the *apparatus* and the way in which the experiment is performed. With the help of the teacher the *results* are discussed and the *conclusions* drawn. The home work consists in writing these experiments in the note-books. Supplementary to the experimental work lessons are assigned from the text-book, Hall's "Elementary Physiology." The following is the writer's outline of a course, based on manuscript for a guide and text-book being prepared by Dr. Maurice A. Bigelow, Adjunct Professor of Biology, Teachers College, Columbia University. This course has been put into practice in the Horace Mann School for the past three years.

Outline of Physiology Course

I. Introduction—Living and Lifeless Things.

Exercise—Pupils are asked to write in their note-books in two parallel columns ten names each of lifeless and living objects. (The following study is primarily about living objects, but something must be known concerning the composition of lifeless matter and the changes which take place.)

A. Lifeless Matter and its Changes.

1. *Physical change.* Three kinds of lifeless matter—solid,

soil—liquid, water—gaseous, air. Discuss how each can be changed to another form. Water (liquid) changed to solid (ice), to gas (steam). Iron (solid) to liquid (molten iron), to gaseous state. Air (gas) to liquid air. In these changes the composition of the substance is not permanently affected,—examples of physical change. Experiment—Common salt dissolved in water, water evaporated by means of sand-bath, salt remains; another example of physical change.

All matter is subject to another kind of change.

2. *Chemical change.* Experiments—(a) Bright iron nails in a moist chamber—red powder of iron rust is formed. (b) Burn piece of magnesium wire—flash of light with smoke and a white powder remaining. In these experiments the resulting powder and smoke cannot again become a part of the original nails or wire so the change is permanent,—examples of chemical change.

All substances in land, air, and water are composed of about 75 elements. Some are very common, such as iron, copper (solids) mercury (liquid), oxygen (gaseous), and have the power of combining with each other, forming compounds. Example—rusting of iron is chemical combination between iron and oxygen. The principle of oxidation is brought out in this connection—example of burning of coal—energy produced—waste materials formed.

Two compounds may be involved in a chemical change. Experiments given to develop this point, for example, combining of soda and vinegar.

B. Camparison of Living and Lifeless Things.

1. *Water*, which is itself lifeless, forms a large part of animals and plants. Experiments—Weigh piece of a plant and piece of meat; expose to air, and when very dry weigh again.
2. *Gaseous substances*, which are themselves lifeless, enter into the composition of animals and plants. Experiment—Place dry plant and meat in "ignition" tube; heat to redness and note escaping gas which will burn when lighted match is applied.

3. *Carbon* or charcoal forms a large part of the solid substance of animals and plants. Experiment—After escape of gas in former experiment the resulting mass is largely charcoal or carbon. Weigh.
4. Solid *mineral substances* in animals and plants. Experiment—Reheat in iron spoon the remains of the former experiment and only ashes remain. Weigh.

These experiments show that all materials which enter into the composition of living things (animals and plants) are also found in lifeless things, viz: soil, water, and air. What then is the difference between living and lifeless objects?

(a) Examine a live frog and compare it with a stone.
   1. Frog moves spontaneously, externally and internally.
   2. Requires food for growth, repairing waste, and for energy.
   3. Breathes—place a frog under a bell-jar with a dish of lime water. Note effect of human breathing on lime water.
   4. Reproduces—lays eggs in the spring.
   5. Dies and decays and separates into substances found in *B.* 1–4.

(b) In the same way examine and compare a living plant with a stone or with a piece of wood.
   1. Plant moves—movements toward light, sensitive plant, internal movements, locomotion in lower plants.
   2. Requires food—experiment by depriving some pea seedlings of their cotyledons and leaving some on.
   3. Breathes—place plant under bell-jar with lime water. Compare with experiment on frog.
   4. Reproduces—seeds.
   5. Dies and decays—refer to *B.* 1–4.

Physiology deals with the movements and changes which take place in living things, so there is introduced here the study, external and internal, of the frog as an example of a living animal. Then a plant is studied in the same way and compared.

II. Structure of a Frog.

A. External—locate and name parts of body (introduce terms dorsal, ventral, lateral, anterior, and posterior—apply to human body).

1. Color of skin (dorsal and ventral), absence of hairs.
2. Head—eyes with eyelids, ear membranes, nostrils which communicate with mouth, mouth.
3. Body—two arms with four fingers, two legs with five toes webbed.

B. Internal—(The teacher dissects a chloroformed frog watched by the pupils.) Bring out the *use* of parts.

1. Mouth—teeth on upper jaw, absence of teeth on lower jaw, tongue, shape and where attached, openings of nostrils, opening of external ear (Eustachian tube), opening down throat, glottis.
2. Skin—(looseness except over bony parts), feel skull, back-bone, shoulder-girdle and sternum, pelvic-girdle, note blood-vessels in skin.
3. Muscles—which move arms, which move abdomen.
4. Body cavity containing the following organs—heart surrounded by pericardium, blood-tubes; demonstrate beating of heart; color.
5. Liver—color, three lobes, gall-bladder, bile-duct.
6. Lungs—insert pippette into glottis and inflate.
7. Food-tube or alimentary canal—trace from mouth to esophagus, stomach (cut open and show folds), small intestine much coiled, pancreas, duct emptying bile and pancreatic juice into small intestine, large intestine or rectum, mesentery with blood-vessels.
8. Kidneys—ureters, urinary bladder.
9. Spleen.
10. Reproductive organs—male and female (development of the frog's egg is watched in the spring, but here the life history is traced by use of models and diagrams from the time the egg and sperm leave the ovary and spermary to the adult frog.
11. Nervous system—brain, spinal-cord, main nerves to arms and legs.

Summary.—Frog is made up of *organs* each doing a special work. Here diagrams of the digestive, circulatory, respiratory,

excretory, reproductive systems of the frog are copied from the board and the parts labelled with the aid of the dissected frog.

C. Tissues—examine a frog's leg, which is an example of an organ.

1. Skin—epithelial tissue (protective).
2. Muscle—muscular tissue (gives movement).
3. Connective tissue between 1 and 2.
4. Nervous tissue (feeling).
5. Bony tissue (support).
6. Cartilage.

Have pupils compare with their hands, which consist of the same materials.

D. Cells.

A piece of the outer skin of the frog is mounted and shown under the microscope. Compare with a thin sheet of gelatine. The epithelial tissue is composed of many cells fitted close together. Examples of muscular, cartilaginous, and bony tissues are shown under the microscope. The idea of a "cell" as used in biology is here developed. The life-activities are centered in the individual cells. The terms protoplasm and nucleus are introduced.

III. Work of the Organs of the Frog.

A. Why Does a Frog Need Food?

Moving and breathing result in loss of weight of the body substance (waste). Example of steam-engine wearing out during motion, also feelings of hunger after vigorous physical or mental exercise. This lost substance must be replaced by some new substance derived from food. A frog then needs food to furnish new substances necessary to replace body substances, which have been worn out owing to activity, and also to furnish materials for growth and for energy.

B. Course of the Food in a Frog's Body.

Food must contain water, carbon, gaseous and mineral substances found in I., *B*.

Most of the food in a solid state passes through the esophagus to the stomach. This must be reduced to a liquid condition so it can "soak through" the stomach walls and be carried to every part of the body. Attempt to dissolve in water, sugar, starch, lean meat, fat meat. This illustrates that most food must be changed to a liquid state by something beside water, *i.e.*, chemicals.

This process of dissolving food is Digestion. Dictate definition.

Digested food must next be distributed to all parts of the body. Examine Hydra under the microscope showing simple distribution—note two layers of cells. Illustrate absorption of digested (liquid) food through stomach walls by four sheets of blotting paper made into a cone into which water is poured. In Hydra, absorption is simple; in frog, the parts of the body are a long distance from the stomach, therefore need of some method of transporting the digested and absorbed food. This is done by the blood which flows in the blood-tubes previously seen. Every cell is thus supplied with food.

C. Changes Occurring in the Cells of the Frog's Body.

Chemical union of oxygen and cell substance produces a kind of slow combustion (oxidation). Refer to and compare the rapid combustion of magnesium wire with the slow process of "rusting" of iron nails.

Oxidation is necessary to the life of the cells of the frog's body. Oxidation requires oxygen and this process of supplying oxygen to the cells is called Respiration. Compare Hydra. The frog needs special organs (lungs and skin) for getting this oxygen. The distribution of this oxygen is the same as that of the food. Show specimens of frog's lung and skin with injected blood-vessels, also gills of the fish.

Oxidation in the cells produces waste material (excretion). CO_2 and nitrogenous substances are the principal excretions. These become poisonous if allowed to accumulate. CO_2 carried by the blood-tubes and given off by the lungs and skin. Nitrogenous substances carried by the blood to the kidneys and given off. Compare Hydra.

The taking of food—digestion—absorption by blood—distribution to living cells by blood-tubes—absorption by cells—supply of oxygen to cells—use of food and oxygen in cells—removal of excretions—these processes taken together are termed Nutrition. Emphasize the fact that each is dependent upon the other and all must work in unison. To accomplish this co-ordination and harmony there is the brain, spinal cord, and nerves (nervous system).

IV. Structure of a Plant.

A. External—name parts of a plant, general use of each.

1. Root—support, takes in liquid substances.

2. Stem—support, carries substances between root and leaf.
3. Leaf—takes in gaseous substances, makes starch.
4. Flower—makes seeds.

B. Internal (illustrate with diagrams on the board and sections under the microscope showing very general structure and use of each.)

1. Root—root-hairs, protective layer, ducts for conducting substances.
2. Stem—protective layer, ducts.
3. Leaf—upper and lower protective layers with openings for passage of gaseous substances, green layers where work is done.

C. Tissues (refer to IV., *B.*, 1, 2, 3).

1. Protecting.
2. Supporting.
3. Conducting.
4. Storage of food and water—examples of potato, onion, turnip, desert plants.

Cells—use microscope to show epidermis of onion with its cells and openings for passage of water and gases. Chara or Elodea showing flow of protoplasm.

D. Development of a Plant.

1. Flower—parts and uses of each—calyx, corolla, stamens (pollen), pistil with ovary.
2. Pollination—use, different methods.
3. Fertilization—compare with frog.
4. Scattering of seed—use, different methods.
5. Development of a seed.
   a. Parts of a seed and the use of each—skin with hilum, cotyledons, hypocotyl, plumule.
   b. Conditions necessary for germination and growth—moisture, warmth, light, air, food.
   c. Method of coming through the ground, developing to an adult plant, and producing flowers.

V. Work of the Organs of Plant.

A. Why Does a Plant Need Food? (Refer to III., *A.*, frog.)

B. How a Plant Gets its Food.

1. Root—root-hairs send out an acid which dissolves solid mineral substances, absorption of water and

mineral substances by root-hairs into ducts of roots.

2. Leaf—CO_2 through openings in the epidermis (starch made in the leaf with the water and CO_2).

C. How Plant Breathes (takes in O through the openings in the epidermis of the leaf).

D. How Food and Oxygen Are Transferred in the Plant.

1. Water—up and down the stem, through veins of the leaf, absorbed into the cells and used in starch making. CO_2 absorbed from the openings into the cells and used in starch making. O absorbed from the epidermal openings into the cells and used in oxidation.
2. Digestion in seeds—food (starch) transferred and stored in or around the cotyledons by parent plant is made liquid (digested) by a ferment, which changes the starch to sugar; digestion of oily foods.
3. Digestion in cells—starch made in the cells changed to sugar by a ferment and mixes with other food substances absorbed by the roots, transferred through the plant to be used either as food, or stored for later use.

E. Changes Common to All Living Cells of a Plant Body.

1. Oxidation—oxygen absorbed and transferred to the different cells mixes with the cell substance and causes oxidation, which gives heat, which supplies energy.
2. Forming of excretions—oxidation forms CO_2, separating carbon, which is used as food, from oxygen and giving off the oxygen.

F. Removal of Excretions.

1. CO_2—through openings in the epidermis—night and day.
2. Oxygen—through openings in the epidermis in the day time.
3. Water—through the openings in the epidermis (transpiration).

In connection with the above work on the plant, experiments found in the elementary text-book of botany are used to illustrate the processes carried on in the plant.

VI. Study of Foods.

Different kinds of food are sugar, starch, proteid (egg albumen, meat), mineral matter, oil or fat. The test for each of these foods is given and a description written in the note-books. Seeds of grains and vegetables tested for kinds of food. Cereals, vegetables, fruits also tested. Results tabulated. Discussion of foods. Examination of the following to find what each contains—milk, egg, flour, meat. Tests for acid and alkaline reactions given. Neutralization explained. Oils or fats changed to emulsion.

VII. Nutrition.

A. Preparation of Food for Absorption.

1. Mastication—diagram showing relation of mouth, pharynx, location of salivary glands and esophagus, copied in note-books. Study of teeth—names and location of different kinds—structure of a tooth. Test saliva with neutral litmus paper.
2. Swallowing—peristaltic action (illustrate with rubber tubing).
3. Digestion—review definition. Review structure of digestive system of the frog. Compare with charts of the human body. Digestive juices and where found. Experiment in osmosis (molasses in artificial membrane cup with glass tube attached and the whole suspended in a jar of water—water rises in tube). This shows process of absorption through an artificial membrane. Compare with walls of stomach. Show same process through the membrane of an egg. (The apparatus for the following experiments is a small glass tube with a membrane of fish bladder on the end and the whole suspended in a small glass bottle of water.) Experiments to illustrate the use of water as a dissolving fluid—sugar, salt, starch, egg albumen, meat, and oil mixed with water and placed in the above tubes to see if the water will dissolve these substances so that they will pass through the membrane. Foods not passing through require digestion. Experiments with the different digestive juices to show that they prepare these same foods for absorption.

Discussions on hygiene, domestic science and economy. (The above work on digestion correlates with the work of domestic science.)

B. Absorption and Assimilation—Discussion.

VIII. Circulation.

Review circulatory system of the frog—pumping of heart. Diagram of the heart of the human body, names of the four chambers and of the blood-vessels which enter and leave the heart. Distinguish between arteries, capillaries, and veins. Note difference in structure, flow of blood through each, use, and location. Pulse. Demonstrate the above points by dissecting sheeps' hearts. Illustrate the pumping of the heart by simple apparatus of rubber bulb and tubing. Show the circulation in the tadpole's tail. Study of blood—compare the human blood with that of the frog. Plasma with red and white corpuscles—uses of each. Discuss the absorption of digested food from the food-tube into the blood-tubes (capillaries)—course of the blood and absorption from the capillaries through cell-walls into the cells. Hygiene—conditions for proper circulation, protection against excessive bleeding, cautions against using the digestive, muscular, and nervous systems at the same time.

IX. Respiration.

Review of organs and use of respiratory system of frog. Diagram of organs of human body including nasal passages, trachea, etc. Use of hairs in the nose. Examine sheep's heart and attached tubes. Use of diaphragm and ribs—illustrate with simple apparatus.

External respiration—inspiration, absorption of oxygen, (oxygenation), expiration.

Internal respiration—distribution of oxygen to cells by blood-tubes, absorption of oxygen by cells and carrying off of waste carbon dioxide from cells to lungs by blood-tubes. Importance of the red blood-corpuscles and their use.

How sound is produced—use of the voice, vocal cords, coughing, sneezing, yawning, hiccoughing, sighing, crying, laughing, sobbing.

Composition of the air—how used in the lungs. Oxygen necessary to body heat (oxidation). Fevers. Bring out correlation of circulation and respiration.

Hygiene—deep breathing, proper clothing, ventilation,

problems concerning amount of space required for schoolroom, sleeping-room, etc., according to the number of persons to be accommodated.

X. Excretion.

Review of excretory organs of frog. Organs of human body —lungs, kidneys with ureters and urinary bladder, skin with sweat-glands, rectum. Waste materials—carbon dioxide, water, nitrogenous substances, and mineral salts. Need for disposal of waste, how each is eliminated.

XI. Heat Regulation.

The skin—epidermis, dermis, pores, hairs, nails, glands.

Use of skin—(1) protection, (2) regulation of temperature, (3) sensation, (4) excretion.

Hygiene—proper care of skin, cleanliness, baths, clothing.

XII. Muscular System.

General shape of muscles, cords or tendons and their use; demonstrate with chicken's foot. Voluntary muscles—arms, legs, etc., under control of will. Involuntary muscles—stomach, intestine, etc. Use of muscles to give movement, generate heat by oxidation.

Hygiene—proper exercise, clothing, slight exercise after heavy meal, brain work before vigorous exercise, need of proper amount of sleep.

XIII. Nervous System.

1. Emphasize the work of the nervous organs as a means by which all the other organs are regulated, co-ordinated, and directed, and as a medium for communication with the world external to the body. Illustrate co-ordinating action by reference to the easily observed effects of violent exercise of the muscular organs upon such processes as breathing, beat of the heart and pulse, excretion through the skin, and heat regulation. Emphasize the dependence of the nervous system upon the nutritive organs.
2. Point out by reference to skeleton, charts, and especially by reference to the pupil's own body, the position of the brain and spinal cord in relation to the other organs of the body.

3. General structure of the brain. A sheep's brain preserved in formaline may be used to illustrate the general form and appearance of the organ. Good models and charts are useful. General form, protective envelopes, division into right and left halves, origin of some of larger nerves and blood-vessels which are important for nutrition of the brain, cerebrum, cerebellum, spinal bulb, spinal cord, and general distribution of the nerves to limbs and other organs of the body. Refer to the nervous system of the frog.

Cerebrum—controls intelligent and voluntary action.

Cerebellum—controls muscle co-ordination.

Spinal bulb—controls contractions of the heart and muscles of respiration.

Nerves—contraction of muscle stimulates nerve and nerve controls the impulse to and from the central nerve organs.

Voluntary action—is illustrated by placing a finger on a piece of metal which is slowly heated until by an effort of will the finger is withdrawn from the unbearable heat.

Reflex action (muscle contraction without will) is illustrated by the involuntary movement resulting from unexpected sudden contact with a hot piece of metal or by closing the eyelids when a blow is threatened.

XIV. General Senses.

Tactile sense—hairs, nerves in skin. Temperature sense—experiment with different temperatures of water. Sense of position.

XV. Special Senses.

Taste (mouth)—taste buds on the tongue in which are the endings of the nerves of taste. Location of the four tastes (sweet, sour, salt, bitter) on the different parts of the tongue.

Smell (nose)—very closely connected with taste. Different flavors not tastes but odors.

Hearing (ear) (use model)—external ear, funnel for catching sound. Middle ear or ear drum—opening of Eustachian

tube into pharynx—three bones, hammer, stirrup, anvil, oval window. Internal ear (vestibule), cochlea, semicircular canals filled with liquid, sound vibrations, care of the ear, wax.

Sight (eye)—eyelids with oil-glands, lashes, tear-glands are appendages of the eye and used for protection. Eyeball (movable), iris (color) with pupil, back of which is the lens for focusing. Location of the tear-gland with the duct leading to the nose. Muscles which move the eye.

XVI. Skeleton.

The framework for support of the body, is made of bone and cartilage (compare with the earthworm).

Spinal column (axis of body) made of pieces (vertebræ) joined together and movable. Ribs and sternum attached to it and form the framework for the thoracic cavity.

Skull—attached at the anterior end of the spinal column.

Shoulder-girdle—shoulder-blades, collar-bone, arms attached (humerus).

Pelvic-girdle—pelvis, legs attached.

General structure of bone, shaft, ball-and-socket joint, hinge-joint.

Hygiene—proper clothing, position of body.

XVII. Bacteriology.

The last few weeks of the year are given to a study of yeast, molds, and bacteria. The lessons are based on Conn's " Yeasts Molds, and Bacteria in the Home."

E. E. R.

ALUMNI DEPARTMENT

Committee of the Alumni on Publication

Ernest N. Henderson (T. C., 1901–03), Adelphi College, Brooklyn, chairman.

Miss Ellen Yale Stevens (T. C., 1891–93), Brooklyn Heights Seminary, 18 Pierrepont St., Brooklyn.

Mrs. Emily Brinckerhoff Brown (T. C., 1899–1901), Bretton Hall, Broadway and 86th St., New York City.

Mr. D. E. Cloyd (T. C., 1901–05), Principal, High School, Spokane, Washington.

Miss Ruth E. Dowling (T. C., 1895–1903), New York Training School for Teachers, New York City.

The Art Department at Teachers College.—To those of the Alumni who have not visited Teachers College within the last two years, a word about the Art Department may be of interest. This department has been under the direction of Mr. Arthur Wesley Dow since the fall of 1904.

Mr. Dow received his art education in Boston and in the Paris ateliers. He spent five years in France in the study of drawing and landscape painting. He exhibited each year in the Salon, receiving honors. After his return to America he became interested in Oriental art and gave several years to research and critical studies of Chinese and Japanese painting, design, and color prints, at the same time pursuing his chosen profession of landscape painter; making twilight a special theme. Professor Dow engaged in art educational work first in Boston and later at the Pratt Institute in Brooklyn, where during eight years he gave instruction in composition, the theory and practice of design, and in drawing and painting. For four years he had charge of composition classes at the Art Students' League of New York. Since 1901 he has conducted a Summer School of Fine Arts at Ipswich, Massachusetts, where design and handicraft and landscape painting combine to make a delightful program for a six-weeks summer school. This work is supplemented by a lecture course on Art Appreciation, illustrated with stereopticon slides.

The broad educational principles which form so large a part of the curriculum of Teachers College find expression in Mr. Dow's work. The principles of Mr. Dow's educational method may be briefly described as follows:

The aim and purpose of art education is a training for power rather than for skill, for critical judgment and appreciation rather than for correctness of representation. It is important that one should learn to draw; it is more important that he should know how to use his drawing.

Art education must affect the whole life, for by it one is trained to feel harmony, not only in the greater works of fine art and in nature, but in handicraft and in the common things about him. This is the first step in creative effort, in fine art. It may be a few words, like savage folk-songs, a few sounds, like an Indian lullaby, or a few lines, like the carving on a Samoan paddle. Here, then, is a suggestion for an educational method. From these simple beginnings in the construction of harmonious units, in the drawing of a few lines in a design or a landscape, the massing of a few spots or tones, and the use of a few hues, one may proceed progressively to patterns, illustrations, figure drawings, landscapes, in fact to any form of expression in the space arts.

With this view of art education, the relation of art to manual training and domestic art becomes apparent. Mr. Dow supervises classes in design for these departments, and also an abridged course for the benefit of those taking the Kindergarten, in the belief that the teacher of very young children should understand and be able to lead the child to love fine things of art and in his own childish way express beauty.

Although design holds so important a place in Mr. Dow's plan of study, it by no means excludes representative drawing.

The regular work of the Junior class includes design, drawing from natural objects, water color, charcoal, and elementary perspective. In the design class, emphasis is placed on the training of the judgment and the knowledge of proportion.

The Senior work deals largely with painting; out-of-door landscape painting when the weather permits, still life, flower painting, figure work, and illustration.

A course of design is worked out in the clay class, where

work proceeds in a progressive series from simple mouldings to low relief and sculpture.

The class in Theory and Practice of Teaching Art is most helpful. Here are discussed the methods of teaching art in schools, and the students have the opportunity of testing these methods in Speyer School. The art work in both Horace Mann and Speyer Schools is under the supervision of Professor Dow. The work of the Art Department is completed by the lecture course on Art Appreciation and History.

Louisville Meeting of the Society of College Teachers of Education.—At the meeting of the Society of College Teachers of Education held on February 27th and 28th at Louisville, Kentucky, in conjunction with the superintendents' meeting, Professor MacVannel presented the paper which constituted the basis of the discussion. For the ensuing year Dean Russell was elected President of the Society. The membership at present numbers 80, of whom 34 have been students at Teachers College or are teachers therein. A dinner of Teachers College men was held during the convention. There were present 23 persons, including Dean Russell, Professors McMurry, Dutton, Monroe, MacVannel, Dexter, Major, Breese, Burris, Hall, Farrington, Suzzallo, Payne, Elliott, Bennett, and Hubbell, President Maxwell, Superintendents Hoyt, Hartwell, Cook, Smith, and Kelley, and Principal Addicott.

Kindergarten Department.—In the department of Kindergarten Education, Professor MacVannel, of the department of the Philosophy of Education, has been made director. Miss Susan Blow has become a permanent lecturer. Miss Patty Hill, of Louisville, and Miss Fulmer, of the University of Chicago, have been appointed instructors; and Mrs. Langzettel, of the Froebel League, lecturer in Extension Teaching. In addition to courses previously given in the Theories of Herbart and Froebel and their relations to modern educational philosophy, in the theory and practice of Kindergarten teaching, in gifts, occupations, songs, games, and stories, the department announces for the coming year courses in Kindergarten Principles and Practice and in the Teaching of Froebel, by Miss Blow; a course in Kindergarten Program and a Kindergarten Conference directed by Miss Hill; new courses relating the work of the

Kindergarten to the primary school and to the life of the home, by Miss Fulmer and Mrs. Langzettel, and other courses correlating the work of the Kindergarten with that of the departments of Domestic Art, Fine Arts, and Physical Education.

Additional Secondary Courses.—For the fuller preparation of prospective teachers in secondary schools, the College announces for the coming year a series of semi-professional courses summarizing the material to be taught from the point of view of the teacher. Examples of these courses are those in the department of English, outlining the distinguishing characteristics of typical literary forms; in German, summarizing accidence, syntax, composition, conversation, and typical texts for the class-room; and in Latin, studying the two thousand words occurring five or more times in the text used for college preparation, as a basis for reading ordinary Latin at sight.

Professor Castle and Professor Rouillion Resign.—Professor E. M. Castle, head of the Department of History since 1897, has resigned because of long-continued ill-health. He will be succeeded in September by Professor Henry Johnson, of the Charleston, Ill., State Normal School, a graduate of the University of Minnesota and a Master of Arts of Columbia, a former student in Paris and Berlin, and a present member of the Illinois State Historical Commission. Professor Louis Rouillion, of the Department of Manual Training, has resigned his connection with Teachers College in order to devote himself entirely to his directorship of the Mechanics Institute, and to become director of the similar new Franklin Union in Boston.

New Instructor in Biology and Nature-Study.—Miss Jean Broadhurst, a graduate of Teachers College three years ago, a former assistant in botany in Barnard College, and now instructor in biology and nature-study in the New Jersey State Normal School at Trenton, has been appointed instructor in biology in Teachers College. She will give special attention to the plant side of nature-study in the college courses and to both plant and animal nature-study in the college schools.

Work in History of Education.—The Department of the History of Education is carrying on an investigation of the origins of certain accepted forms of educational organizations, based on

the 17th and 18th century records of a large number of New England towns, and on the later history of a number of cities of the Middle States. The results are being grouped into comprehensive surveys of the origins of the district school system, and of the development of the public school out of schools founded by religious or charitable societies.

Corrective Work in College Schools.—The Department of Physical Education has found that the 1200 typical city children attending the college schools are below the average in muscular co-ordination and endurance and in nervous control, although they are above the average in height and sensitiveness. To remedy these deficiencies, the department has devised a system which bases the arrangement of the school program and of the schoolroom and the requirement and treatment of each child on tests of sight, hearing, muscular and nervous system, throat, lungs, and heart. Corrective exercises are prescribed when necessary. Relaxation is provided through frequent periods for games that make varying muscular demands. Observation, alertness, judgment, co-ordination, and precision are cultivated by other specially devised games, and by manual training and art work with large implements. Both muscular development and individual expression are obtained through daily marches and dances, in addition to the work with the usual gymnasium equipment. The beneficial effects of the plan are already evident.

Department of Domestic Science.—The following appointments are announced for the year 1906–07:

Dr. Henry C. Sherman, Adjunct Professor of Analytical Chemistry, Columbia University, will open the course in dietaries with a series of ten or twelve lectures. Dr. Sherman will be assisted by Miss Mary D. Swartz, B.S., Teachers College, who will also conduct the practical work for the remainder of the course.

Mrs. Ellen H. Richards, Mass. Institute of Technology, will give a series of four lectures on Institutional Dietaries.

Miss M. Adelaide Nutting, of the Johns Hopkins Hospital, Baltimore, Md., has been appointed Professor of Institutional Management in connection with this department. She received a diploma from the Johns Hopkins Training School for nurses

in 1891 and has since that date been engaged as follows: assistant superintendent of nurses, Johns Hopkins Hospital Training School, 1893–94; superintendent of nurses and principal of training school, 1894–1907; secretary of the American Society of Superintendents of Training Schools for Nurses, 1903–06; president of the Maryland State Association of Graduate Nurses, 1903, and honorary president, 1906; member of the International Council of Nurses; president of the American Federation of Nurses, 1900–. In this connection it is of interest to note that at the recent graduation exercises of the Training School for Nurses of Johns Hopkins University the *Baltimore American* states that Dr. Daniel C. Gilman paid a most appreciative tribute to the quality and importance of the work Miss Nutting had done at Johns Hopkins and said she would carry with her the esteem and profound regard of all with whom she had been associated. Of Miss Nutting's new position he said: "She goes forward to a broader and higher field of labor. She will hold a professorship quite unique among all academic callings. She is the first to be appointed to it, and I doubt whether anybody could be found who is better suited to take up the new work than Miss Nutting." He ended by turning to Miss Nutting and telling her that he wished she might live as long as Florence Nightingale, whose birthday has just been celebrated, and that every year would win for her fresh laurels. Miss Nutting will be absent on leave for the year 1906–07, except for a month or two of the second semester.

Miss Anna Barrows, of Boston, has also been added to the staff as lecturer, and announces courses in Household Technique, Food Preparation, and Dietaries, and specialized preparation for industrial, institutional, and demonstration work.

Wm. Henry Boynton, Columbia, Applied Science, 1906, has been appointed assistant in Household Chemistry, Teachers College.

CLASS NOTES.

1893. Susan Adele Lathrop has been appointed assistant in English, Wellesley College, Wellesley, Mass.

1899. Henry A. Davis is Director of Manual Training, Miami University, Oxford, Ohio.

1900. Alice R. Jackson, A.M., English, Morris Heights High School, N. Y.

1901. David S. Snedder, Adjunct Professor, Educational Administration, Teachers College.

1902. Fanny C. Berkeley (A.M. 1904), Instructor in English, University of Wisconsin, Madison, Wis.

Jeannette R. Seibert, Recorder, Physical Education Department, Teachers College.

1903. Jean Broadhurst, Instructor in Biology, Teachers College.

Mary D. Chambers, Domestic Science, Rockford College, Rockford, Ill.

William W. Andrew (A. M.), Principal Elementary School, Rochester, N. Y.

1904. Annie F. Burbank, Head of Department of Domestic Science, Northfield Seminary, East Northfield, Mass.

Lucius R. Russell, Chemistry, Simmons College, Boston, Mass.

Fred C. Whitcomb, Manual Training, Miami University, Oxford, O.

1905. Floe Farlow, Primary Critic, State Normal School, Valley City, N. D.

Lillie N. Lawrence, Latin, Ethical Culture School, New York.

Lucile H. Stimson, Asst. Domestic Science, Simmons College, Boston, Mass.

Mrs. Mary A. Walker, Principal, Washington Cathedral School, Washington, D.C.

1906. Suzan Benedict, Assistant in Mathematics, Smith College, Northampton, Mass.

Alma Binzel, Director of Kindergarten Training and Primary Supervisor, Stout Training School, Menomonie, Wis.

Harriet I. Carter, Critic Teacher, State Normal School, Winona, Minn.

Julia A. Hill, Head of Art Department, Teachers College, Syracuse University, Syracuse, N. Y.

Dora Ladd, Critic, State Normal School, Greeley, Col.

Alice L. Marsh, Methods, State Normal School, Geneseo, N. Y.

Among the graduate students the following appointments have been made:

J. Henry Highsmith, Psychology, Baptist University for Women, Raleigh, N. C.

Gerard R. Lomer, English, Normal School, Montreal, Can.

Vernon L. Mays, Superintendent of Schools, Dixon, Ill.

COLLEGE DIRECTORY.

Readers of THE RECORD probably know that an endeavor is being made to form a College Directory, to include all students who have done work at Teachers College. The list which follows is given in the hope that some reader will be able to supply the address of one or more of those whose names are given. All information should be sent to Miss I. L. Pratt, Appointment Secretary, Teachers College.

Adams, Minnie Estella
Allen, Abbie
Andrew, Marguerite
Annin, Aletta
Anthony, Emma Josephine
Appel, John Frank
Armstrong, Easter Elis
Avery, Miss C. A.
Ayres, Harriet Bower

Baile, Cora Livingston
Baker, Emily Hinckley
Barnard, Mary Eliza
Barnes, Emma L.
Barstow, Margaret
Bartlett, Ada
Bassett, James, Jr.
Benedict, Grace Gorton
Bidwell, Claire Augusta
Blake, Marian Eva
Boak, Mabel
Bohn, Flora Theodora
Bordwell, Walter Percy
Boudy, Ella
Brainerd, Katherine
Bridgart, Lillian Josephine
Brower, Geo. Griswold
Brown, Helen L.
Brown, Gertrude N.
Brush, Edward Hale
Burchill, Georgine
Butts, Iona M.

Campbell, Magdalene
Carpenter, Irene Amelia
Carroll, Mary R.
Chapman, Eldora Lyman
Chase, Jennie M.
Cheesman, Teresa
Clark, Sarah
Cockle, Mary Leverett
Colman, Charlotte Gorham
Comstock, Ada L.
Conklin, Esther M. E.
Cook, Harry
Croker, Anna
Cunningham, Marion
Curtis, Arthur B.
Cushman, Arthur Alfred

Davis, Ella Stone
Degen, Catharine A.
Dempsey, Wm. Theobald
Denzer, Arline (Miss)
Dillon, Anna A.
Dixon, Maidsa (Miss)
Dodd, Loring Holmes (Mr.)
Dodge, Frances Holden
Douglas, Julia Brewster
Drimmig, Carrie Josephine
Dunne, Eliza E.

Elner, Sarah
English, Lena Leota

Fawcett, Sara Abbie
Ferrie, Matilda
Flynn, Marie E.
Fowler, Wilson
Freeman, Frances Austin
French, Jessie Belle

Garnett, Sarah Jane
Getchell, Mrs. J. B.
Gibson, Lillian Ruth
Gilbert, Bessie Sprague
Gilman, Elizabeth Hale
Ginn, Elizabeth R.
Goodchild, Julia L.
Goodlau, Beatrice Rose
Goertner, Rose Landan
Goldman, Sophie

Habberton, Mary Elizabeth
Hall, Clara Louise
Hallock, Anna Walter
Halsted, Carrie
Hammond, Lucy E.
Hawthorne, Valetta
Hays, G. Dalton
Hayward, Marion Isabel
Hayward, Virginia Kate
Heath, Edna Caroline
Heidelberg, Louise M.
Herrick, Hilda Hayes
Hetfield, Emma

Houghton, Mrs. W. E.
Hubbard, Alice C.
Hutchinson, Minnie

Innes, Elizabeth Richard
Innes, Susan W.

Jackson, Mrs. L. L.
Jarvis, Ida May
Jaynes, Flora M.
Johnston, Katherine D.
Jones, Ralph W.

Kaye, Marie E.
Kemphe, Ida Louise
Knox, Josephine

La Velle, Ida Blanche
Law, Mary Farrington
Lawyer, Louis R.
Lee, Ellen Gertrude
Linde, Lucy Augusta
Lindsey, Lida E.
Lockwood, Cornelius W.
Lophie, Hannah
Love, Mary
Lowland, Emily R.
Luce, Miss V.
Lutterlob, Anna
Lyle, Margaret Belle
Lynch, John Henry

MacAlpine, Agnes
McConnell, Grace Evelyn
McCormick, E. Maurice
McDermott, Cordelia
McKelvey, Mrs. R. H.
McLoud, Irene Rankin
Marot, Mary L.
Marshall, Anna
Martinache, Coralie
Martyn, Mrs. Carlos
Meeks, Anna Morrell
Merritt, Maud Dexter
Mesick, Charlotte P.
Miller, Anne Maxwell
Moore, Mary Elizabeth
Morrison, Jennie Hunnewell
Musky, Minnie

Norris, Sarah Elizabeth
Norton, Nellie Goodline

Oakes, Eva M.
Oakley, Effie Dell
Oppenheim, Julius

Patten, Mary Elizabeth
Patterson, Annie
Pfenningwerth, Herman
Phillipson, Paul Herman
Potter, Grace Warren
Potter, Mrs. Sydney F.
Powers, Mrs. Katherine N.

Redmond, Mrs. Daniel
Reynolds, Ione A.
Richards, Samuel James
Rose, Mary N.
Ross, Isidor
Ryder, Hannah B.

Seaman, Mrs. Henry B.
Seward, Louisa Roe
Seymour, Lydia
Shear, Cornelius Lott
Sibley, Kate
Sickles, Sibyl Matilda
Sloan, Sturman Grace
Smith, Edward Anderson
Smith, Marie Louise
Smith, Anna Mabel
Smith, Ella Emma
Smith, Daisy Keever
Snell, Mrs. A. H.
Spencer, Sarah
Springer, Gertrude C.
Stanbach, Wilhelmina
Stauffer, Mr. Amos Frank
Steben, Mabel Jessie
Stevens, Helena B.
Stevenson, Susie
Stiles, Florence Fraser
Stowell, Harriet L.
Strong, Mary C.
Sturenbury, Eleanor

Taylor, John W.
Taylor, Ella Louise

Taylor, Grace L.
Thomas, Caroline Elizabeth
Titus, H. Stanleyetta
Tomkinson, Laura M.

Van Kirk, Agnes Ellis
Van Voorhis, Emma
Vermilye, Amos J.

Waterbury, Charlotte
Watkins, Amy Spencer
Wardlow, Jeannette B.
Wehle, Elizabeth L.
Wells, Cornelia
Wessels, Ella
White, Margaret Howard
Wicks, Mrs.
Williams, Mary Emma
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Worth, Addie Josephine

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